



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE STRUCTURE AND SYLLABUS

For

B. TECH ELECTRONICS AND COMMUNICATION ENGINEERING

(Applicable for batches admitted from 2019-2020)



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA - 533 003, Andhra Pradesh, India



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year – I SEMESTER

Sl. No	Course Code	Subjects	L	T	P	Credits
1	HS1101	English	3	0	0	3
2	BS1101	Mathematics - I	3	0	0	3
3	BS1106	Applied Chemistry	3	0	0	3
4	ES1101	Programming for Problem Solving Using C	3	0	0	3
5	ES1103	Engineering Drawing	1	0	3	2.5
6	HS1102	English Lab	0	0	3	1.5
7	BS1107	Applied Chemistry Lab	0	0	3	1.5
8	ES1102	Programming for Problem Solving Using C Lab	0	0	3	1.5
9	MC1101	Environmental Science	3	0	0	0
Total Credits			16	0	12	19

I Year – IISEMESTER

Sl. No	Course Code	Subjects	L	T	P	Credits
1	BS1202	Mathematics – II	3	0	0	3
2	BS1203	Mathematics – III	3	0	0	3
3	BS1204	Applied Physics	3	0	0	3
4	ES1209	Network Analysis	3	0	0	3
5	ES1211	Basic Electrical Engineering	3	0	0	3
6	ES1215	Electronic workshop	0	0	2	1
7	ES1208	Basic Electrical Engineering Lab	0	0	3	1.5
8	BS1205	Applied Physics Lab	0	0	3	1.5
9	HS1203	Communication Skills Lab	0	0	2	1
10	PR1201	Engineering Exploration Project	0	0	2	1
			15	0	12	21



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II Year – I Semester

S. No.	Course	Category	L	T	P	Credits
1	Electronic Devices and Circuits	PC	3	0	0	3
2	Switching Theory and Logic Design	PC	3	0	0	3
3	Signals and Systems	PC	3	0	0	3
4	Random Variables and Stochastic Processes	PC	3	0	0	3
5	Object Oriented Programming through Java	ES	3	0	0	3
6	Managerial Economics & Financial Analysis	HS	3	0	0	3
7	Electronic Devices and Circuits - Lab	LC	0	0	3	1.5
8	Switching Theory and Logic Design - Lab	LC	0	0	3	1.5
9	Constitution of India	MC	3	0	0	0
			Sub-Total			21

II Year – II Semester

S. No.	Course	Category	L	T	P	Credits
1	Electronic Circuit Analysis	PC	3	0	0	3
2	Linear Control Systems	PC	3	0	0	3
3	Electromagnetic Waves and Transmission Lines	PC	3	0	0	3
4	Analog Communications	PC	3	0	0	3
5	Computer Architecture and Organization	ES	3	0	0	3
6	Management and Organizational Behavior	HS	3	0	0	3
7	Electronic Circuit Analysis - Lab	LC	0	0	3	1.5
8	Analog Communications - Lab	LC	0	0	3	1.5
			Sub-Total			21



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III Year – I Semester

S. No.	Course	Category	L	T	P	Credits
1	Linear Integrated Circuits and Applications	PC	3	0	0	3
2	Microprocessor and Microcontrollers	PC	3	0	0	3
3	Digital Communications	PC	3	0	0	3
4	Electronic Measurements & Instrumentation	PC	3	0	0	3
5	Professional Elective (PE 1)	PE	3	0	0	3
6	Linear Integrated Circuits and Applications - Lab	LC	0	0	3	1.5
7	Digital Communications Lab	LC	0	0	3	1.5
8	Microprocessor and Microcontrollers - Lab	LC	0	0	3	1.5
9	Mini Project with Hardware Development	PR	0	0	3	1.5
10	Essence of Indian Traditional Knowledge	MC	3	0	0	0
			Sub-Total			21

III Year – IISemester

S. No.	Course	Category	L	T	P	Credits
1	Wired and Wireless Transmission Devices	PC	3	0	0	3
2	VLSI Design	PC	3	0	0	3
3	Digital Signal Processing	PC	3	0	0	3
4	Professional Elective (PE2)	PE	3	0	0	3
5	Open Elective (OE1)	OE	3	0	0	3
6	Internet of Things	PC	3	0	0	3
7	VLSI Lab	LC	0	0	3	1.5
8	Digital Signal Processing Lab	LC	0	0	3	1.5
9	Intellectual Property Rights (IPR) & Patents	MC	3	0	0	0
			Sub-Total			21



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IV Year – I Semester

S. No.	Course	Category	L	T	P	Credits
1	Microwave and Optical Communication Engineering	PC	3	0	0	3
2	Data Communications & Computer networks	PC	3	0	0	3
3	Digital Image and Video Processing	PC	3	0	0	3
4	Professional Elective (PE3)	PE	3	0	0	3
5	Professional Elective (PE4)	PE	3	0	0	3
6	Internet of Things Lab	LC	0	0	3	1.5
7	Microwave and Optical Communication Engineering LAB	LC	0	0	3	1.5
8	Project - Part I	PR	0	0	6	3
			Sub-Total			21

IV Year – II Semester

S. No.	Course	Category	L	T	P	Credits
1	Professional Elective (PE5)	PE	3	0	0	3
2	Open Elective (OE2)	OE	3	0	0	3
3	Project - Part II	PR	0	0	18	9
			Sub-Total			15
			Total			160



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PROFESSIONAL ELECTIVES 1:

1. Information Theory & Coding
2. Digital System Design using HDL
3. Data structures and Algorithms
4. Soft computing techniques and Python programming
5. Simulation & Mathematical Modeling

PROFESSIONAL ELECTIVES 2:

1. Cellular & Mobile Communication
2. Digital IC Design
3. Business Intelligence & Analytics
4. Pattern Recognition
5. Robotics and Automation

PROFESSIONAL ELECTIVES 3:

1. Communication Standards and Protocols
2. Analog IC Design
3. Smart Sensors
4. Advanced Digital Signal Processing
5. Augmented Reality

PROFESSIONAL ELECTIVES 4:

1. Software Radio
2. Low power VLSI Design
3. Embedded Systems
4. DSP processors and Architectures
5. Multi Media Communication

PROFESSIONAL ELECTIVES 5:

1. Wireless Communication
2. VLSI Testing & Testability
3. Machine Learning & Artificial Intelligence
4. Speech Processing
5. Industrial Internet of Things



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OPEN ELECTIVES FOR ECE:

Open Elective 1:

1. DataMining
2. PowerElectronics
3. MEMS and itsapplications
4. Artificial NeuralNetworks

Open Elective 2:

1. 3D Printing
2. Block chainTechnology
3. Cyber Security &Cryptography

OPEN ELECTIVES OFFERED BY ECE:

- OE 1 Principles of communication
OE 2 Embedded Systems



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I Year - I Semester	L	T	P	C
	3	0	0	3
ENGLISH				

Introduction

The course is designed to train students in receptive (listening and reading) as well as productive and interactive (speaking and writing) skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from *learning about the language* to *using the language*. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as IELTS, TOEFL, or BEC, besides being able to express themselves clearly in speech and competently handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratory sessions.

Course Objectives

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by nativespeakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Learning Outcomes

At the end of the module, the learners will be able to

- understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
- ask and answer general questions on familiar topics and introduce oneself/others
- employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
- recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
- form sentences using proper grammatical structures and correct wordforms



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Unit 1:

Lesson-1: A Drawer full of happiness from “**Infotech English**”, Maruthi Publications

Lesson-2: Deliverance by Premchand from “**The Individual Society**”, Pearson Publications.
(Non-detailed)

Listening: Listening to short audio texts and identifying the topic. Listening to short audio texts and identifying the context and specific pieces of information to answer a series of questions both in speaking and writing.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests. Self introductions and introducing others.

Reading: Skimming text to get the main idea. Scanning to look for specific pieces of information.

Reading for Writing: Paragraph writing (specific topics) using suitable cohesive devices; linkers, sign posts and transition signals; mechanics of writing - punctuation, capital letters.

Vocabulary: Technical vocabulary from across technical branches (20) GRE Vocabulary (20) (Antonyms and Synonyms, Word applications) Verbal reasoning and sequencing of words.

Grammar: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countables and uncountables; singular and plural basic sentence structures; simple question form - wh-questions; word order in sentences.

Pronunciation: Vowels, Consonants, Plural markers and their realizations

Unit 2:

Lesson-1: Nehru’s letter to his daughter Indira on her birthday from “**Infotech English**”, Maruthi Publications

Lesson-2: Bosom Friend by Hira Bansode from “**The Individual Society**”, Pearson Publications. (Non-detailed)

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts, both in speaking and writing.

Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks. Functional English: Greetings and leave takings.

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.



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Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words) (Antonyms and Synonyms, Word applications)

Grammar: Use of articles and zero article; prepositions.

Pronunciation: Past tense markers, word stress-di-syllabic words

Unit 3:

Lesson-1: Stephen Hawking-Positivity ‘Benchmark’ from “**Infotech English**”, Maruthi Publications

Lesson-2: Shakespeare’s Sister by Virginia Woolf from “**The Individual Society**”, Pearson Publications. (Non-detailed)

Listening: Listening for global comprehension and summarizing what is listened to, both in speaking and writing.

Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed. Functional English: Complaining and Apologizing.

Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension. Critical reading.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Letter writing-types, format and principles of letter writing. E-mail etiquette, Writing CV’s.

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Association, sequencing of words

Grammar: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Pronunciation: word stress-poly-syllabic words

Unit 4:

Lesson-1: Liking a Tree, Unbowed: Wangari Maathai-biography from “**Infotech English**”, Maruthi Publications

Lesson-2: Telephone Conversation-Wole Soyinka from “**The Individual Society**”, Pearson Publications. (Non-detailed)



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Listening: Making predictions while listening to conversations/ transactional dialogues without video (only audio); listening to audio-visual texts.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. Functional English: Permissions, Requesting, Inviting.

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicative process or display complicated data.

Reading for Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. Writing SOP, writing for media.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Cloze Encounters.

Grammar: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms

Pronunciation: Contrastive Stress

Unit 5:

Lesson-1: Stay Hungry-Stay foolish from “**Infotech English**”, Maruthi Publications

Lesson-2: Still I Rise by **Maya Angelou** from “**The Individual Society**”, Pearson Publications. (Non-detailed)

Listening: Identifying key terms, understanding concepts and interpreting the concepts both in speaking and writing.

Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides. Functional English: Suggesting/Opinion giving.

Reading: Reading for comprehension. RAP Strategy Intensive reading and Extensive reading techniques.

Reading for Writing: Writing academic proposals- writing research articles: format and style.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Coherence, matching emotions.

Grammar: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)



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Pronunciation: Stress in compound words

Prescribed text books for theory for Semester-I:

1. “**Infotech English**”, Maruthi Publications.(Detailed)
2. “**The Individual Society**”, Pearson Publications.(Non-detailed)

Reference books:

1. Bailey, Stephen. Academic writing: A handbook for international students.Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking.Heinley ELT;
2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) MacmillanEducational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP,2012.



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I Year - I Semester		L	T	P	C
		3	0	0	3
MATHEMATICS-I (Common to all Branch's for I Year B.Tech)					

Course Objectives:

- This course will illuminate the students in the concepts of calculus.
- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Course Outcomes: At the end of the course, the student will be able to

- utilize mean value theorems to real life problems (L3)
- solve the differential equations related to various engineering fields (L3)
- familiarize with functions of several variables which is useful in optimization (L3)
- Apply double integration techniques in evaluating areas bounded by region (L3)
- students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems (L5)

UNIT I: Sequences, Series and Mean value theorems:**(10hrs)**

Sequences and Series: Convergence and divergence – Ratio test – Comparison tests – Integral test – Cauchy's root test – Alternate series – Leibnitz's rule.

Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders.

UNIT II: Differential equations of first order and first degree:**(10 hrs)**

Linear differential equations – Bernoulli's equations – Exact equations and equations reducible to exact form.

Applications: Newton's Law of cooling – Law of natural growth and decay – Orthogonal trajectories – Electrical circuits.



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UNIT III: Linear differential equations of higher order: (10 hrs)

Non-homogeneous equations of higher order with constant coefficients – with non-homogeneous term of the type e^{ax} , $\sin ax$, $\cos ax$, polynomials in x^n , $e^{ax}V(x)$ and $x^nV(x)$ – Method of Variation of parameters.

Applications: LCR circuit, Simple Harmonic motion.

UNIT IV: Partial differentiation: (10 hrs)

Introduction – Homogeneous function – Euler’s theorem – Total derivative – Chain rule – Jacobian – Functional dependence – Taylor’s and Mc Laurent’s series expansion of functions of two variables.

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange’s method (with constraints).

UNIT V: Multiple integrals: (8hrs)

Double and Triple integrals – Change of order of integration – Change of variables.

Applications: Finding Areas and Volumes.

Text Books:

1. **B. S. Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **B. V. Ramana**, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India.
2. **Joel Hass, Christopher Heil and Maurice D. Weir**, Thomas calculus, 14th Edition, Pearson.
3. **Lawrence Turyn**, Advanced Engineering Mathematics, CRC Press, 2013.
4. **Srimantha Pal, S C Bhunia**, Engineering Mathematics, Oxford University Press.



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I Year - I Semester		L	T	P	C
		3	0	0	3
APPLIED CHEMISTRY					

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

Learning Objectives:

- **Importance** of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- **Outline** the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
- **Express** the increase in demand as wide variety of advanced materials are introduced; which have excellent engineering properties.
- **Explain** the crystal structures, and the preparation of semiconductors. Magnetic properties are also studied.
- **Recall** the increase in demand for power and hence alternative sources of power are studied due to depleting sources of fossil fuels. Advanced instrumental techniques are introduced.

UNIT I POLYMER TECHNOLOGY

Polymerisation:- Introduction-methods of polymerization (emulsion and suspension)-physical and mechanical properties.

Plastics: Compounding-fabrication (compression, injection, blown film, extrusion) - preparation, properties and applications of PVC, polycarbonates and Bakelite-mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste.

Elastomers:- Natural rubber-drawbacks-vulcanization-preparation, properties and applications of synthetic rubbers (Buna S, thiokol and polyurethanes).

Composite materials: Fiber reinforced plastics-conducting polymers-biodegradable polymers-biopolymers-biomedical polymers.

Learning Outcomes: At the end of this unit, the students will be able to

- **Outline** the properties of polymers and various additives added and different methods of forming plastic materials.
- **Explain** the preparation, properties and applications of some plastic materials.
- **Interpret** the mechanism of conduction in conducting polymers.
- **Discuss** natural and synthetic rubbers and their applications.

UNIT II: ELECTROCHEMICAL CELLS AND CORROSION

Single electrode potential-Electrochemical series and uses of series-standard hydrogen electrode, calomel electrode-concentration cell-construction of glass electrode-Batteries: Dry cell, Ni-Cd cells, Ni-Metal hydride cells, Li ion battery, zinc air cells-Fuel cells: H₂-O₂, CH₃OH-O₂, phosphoric acid, molten carbonate.

Corrosion:- Definition-theories of corrosion (chemical and electrochemical)-galvanic corrosion, differential aeration corrosion, stress corrosion, waterline corrosion-passivity of metals-galvanic series-factors influencing rate of corrosion-corrosion control (proper designing, cathodic



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protection)-Protective coatings: Surface preparation, cathodic and anodic coatings, electroplating, electroless plating (nickel). Paints (constituents, functions, specialpaints).

Learning Outcomes: *At the end of this unit, the students will be able to*

- *Explain* the theory of construction of battery and fuelcells.
- *Categorize* the reasons for corrosion and study some methods of corrosioncontrol.

UNIT III: MATERIAL CHEMISTRY

Part I : Non-elemental semiconducting materials:- Stoichiometric, controlled valency & chalcogen photo/semiconductors-preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling, epitaxy, diffusion, ion implantation) - Semiconductor devices (p-n junction diode as rectifier, junction transistor).

Insulators & magnetic materials: electrical insulators-ferro and ferri magnetism-Hall effect and its applications.

Part II:

Nano materials:-Introduction-sol-gel method- characterization by BET, SEM and TEM methods-applications of graphene-carbon nanotubes and fullerenes: Types, preparation and applications

Liquid crystals:-Introduction-types-applications.

Super conductors:-Type –I, Type II-characteristics and applications

Learning Outcomes: *At the end of this unit, the students will be able to*

- *Understand* the importance of materials like nanomaterials and fullerenes and theiruses.
- *Understand* liquid crystals andsuperconductors.
- *Understand* the preparation ofsemiconductors.

UNIT IV: ADVANCED CONCEPTS/TOPICS IN CHEMISTRY

Computational chemistry: Introduction, Ab Initio studies

Molecular switches: characteristics of molecular motors and machines, Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid-base controlled molecular shuttle, a molecular elevator, an autonomous light-powered molecular motor

Learning Outcomes: *At the end of this unit, the students will be able to*

- *Obtain* the knowledge of computationalchemistry
- *Understand* importance molecularmachines

UNIT V: SPECTROSCOPIC TECHNIQUES & NON CONVENTIONAL ENERGY SOURCES

Part A: SPECTROSCOPIC TECHNIQUES

Electromagnetic spectrum-UV (laws of absorption, instrumentation, theory of electronic spectroscopy, Frank-condon principle, chromophores and auxochromes, intensity shifts, applications), FT-IR (instrumentation and IR of some organic compounds, applications)-magnetic resonance imaging and CT scan (procedure & applications).

Part B: NON CONVENTIONAL ENERGY SOURCES

Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, tidal and wave power, ocean thermal energy conversion.



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Learning Outcomes: *At the end of this unit, the students will be able to*

- understand the principles of different analytical instruments.
- explain the different applications of analytical instruments.
- design sources of energy by different natural sources.

Standard Books:

1. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publishing Co.

Reference Books:

1. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2019 edition.



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I Year - I Semester		L	T	P	C
		3	0	0	3
PROGRAMMING FOR PROBLEM SOLVING USING C					

COURSE OBJECTIVES: COURSE OBJECTIVES:

The objectives of Programming for Problem Solving Using C are

- 1) To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
- 2) To gain knowledge of the operators, selection, control statements and repetition in C
- 3) To learn about the design concepts of arrays, strings, enumerated structure and union types. To learn about their usage.
- 4) To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor.
- 5) To assimilate about File I/O and significance of functions

UNIT I

Introduction to Computers: Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers

Introduction to the C Language: Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers.

Structure of a C Program: Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.

UNIT II

Bitwise Operators: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators.

Selection & Making Decisions: Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions

Repetition: Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples

UNIT III

Arrays: Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Example – Calculate Averages

Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code

Enumerated, Structure, and Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application

UNIT IV

Pointers: Introduction, Pointers to pointers, Compatibility, L value and R value

Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application

Processor Commands: Processor Commands



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UNIT V

Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter-Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers to Functions, Recursion

Text Input / Output: Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions

Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.

TEXT BOOKS:

1. Programming for Problem Solving, Behrouz A. Forouzan, Richard F. Gilberg, CENGAGE
2. The C Programming Language, Brian W. Kernighan, Dennis M. Ritchie, 2e, Pearson

REFERENCES:

1. Computer Fundamentals and Programming, Sumithabha Das, Mc GrawHill
2. Programming in C, Ashok N. Kamthane, Amit Kamthane, Pearson
3. Computer Fundamentals and Programming in C, Pradip Dey, Manas Ghosh, OXFORD

COURSE OUTCOMES:

Upon the completion of the course the student will learn

- 1) To write algorithms and to draw flowcharts for solving problems
- 2) To convert flowcharts/algorithms to C Programs, compile and debug programs
- 3) To use different operators, data types and write programs that use two-way/ multi-way selection
- 4) To select the best loop construct for a given problem
- 5) To design and implement programs to analyze the different pointer applications
- 6) To decompose a problem into functions and to develop modular reusable code
- 7) To apply File I/O operations



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year - I Semester		L	T	P	C
		1	0	3	2.5
ENGINEERING DRAWING					

Course Objective: Engineering drawing being the principal method of communication for engineers, the objective is to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

Unit I

Objective: To introduce the students to use drawing instruments and to draw polygons, Engg. Curves.

Polygons: Constructing regular polygons by general methods, inscribing and describing polygons on circles.

Curves: Parabola, Ellipse and Hyperbola by general and special methods, cycloids, involutes, tangents & normals for the curves.

Scales: Plain scales, diagonal scales and vernier scales

Unit II

Objective: To introduce the students to use orthographic projections, projections of points & simple lines. To make the students draw the projections of the lines inclined to both the planes.

Orthographic Projections: Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines, line parallel to both the planes, line parallel to one plane and inclined to other plane.

Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces.

Unit III

Objective: The objective is to make the students draw the projections of the plane inclined to both the planes.

Projections of planes: regular planes perpendicular/parallel to one reference plane and inclined to the other reference plane; inclined to both the reference planes.

Unit IV

Objective: The objective is to make the students draw the projections of the various types of solids in different positions inclined to one of the planes.

Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to both the planes.



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Unit V

Objective: The objective is to represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and viceversa.

Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer Aided Design, Drawing practice using Auto CAD, Creating 2D&3D drawings of objects using Auto CAD

Note: In the End Examination there will be no question from CAD.

TEXT BOOKS:

1. Engineering Drawing by N.D. Butt, Chariot Publications
2. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers

REFERENCE BOOKS:

1. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers
2. Engineering Graphics for Degree by K.C. John, PHI Publishers
3. Engineering Graphics by P.I. Varghese, McGraw Hill Publishers
4. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age

Course Outcome: The student will learn how to visualize 2D & 3D objects.



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I Year - I Semester	L	T	P	C
	0	0	3	1.5
ENGLISH LAB				

UNIT I:

Vowels, Consonants, Pronunciation, Phonetic Transcription

UNIT II:

Past tense markers, word stress-di-syllabic words, Poly-Syllabic words

UNIT III:

Rhythm & Intonation

UNIT IV:

Contrastive Stress (Homographs)

UNIT V:

Word Stress: Weak and Strong forms
 Stress in compound words

References books:

1. Infotech English, Maruthi Publications. (with CompactDisc)
2. Exercises in Spoken English Part 1,2,3,4, OUP andCIEFL.
3. English Pronunciation in use- Mark Hancock, Cambridge UniversityPress.
4. English Phonetics and Phonology-Peter Roach, Cambridge UniversityPress.
5. English Pronunciation in use- Mark Hewings, Cambridge UniversityPress.
6. English Pronunciation Dictionary- Daniel Jones, Cambridge UniversityPress.
7. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.



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I Year - I Semester		L	T	P	C
		0	0	3	1.5
APPLIED CHEMISTRY LAB					

Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions,
 volumetric titrations, quantitative analysis

1. Determination of HCl using standard Na_2CO_3 solution.
2. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH .
3. Determination of Mn (II) using standard oxalic acid solution.
4. Determination of ferrous iron using standard $\text{K}_2\text{Cr}_2\text{O}_7$ solution.
5. Determination of copper (II) using standard hypso solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of iron (III) by a colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
9. Determination of the concentration of strong acid vs strong base (by conductometric method).
10. Determination of strong acid vs strong base (by potentiometric method).
11. Determination of Mg^{+2} present in an antacid.
12. Determination of CaCO_3 present in an eggshell.
13. Estimation of Vitamin C.
14. Determination of phosphoric content in soft drinks.
15. Adsorption of acetic acid by charcoal.
16. Preparation of nylon-6, 6 and Bakelite (demonstration only).

Of the above experiments at-least 10 assessment experiments should be completed in a semester.

Outcomes: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Reference Books

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.



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I Year - I Semester		L	T	P	C
		0	0	3	1.5
PROGRAMMING FOR PROBLEM SOLVING USING C LAB					

Course Objectives:

- 1) Apply the principles of C language in problemsolving.
- 2) To design flowcharts, algorithms and knowing how to debugprograms.
- 3) To design & develop of C programs using arrays, strings pointers &functions.
- 4) To review the file operations, preprocessorcommands.

Exercise 1:

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and fourcharacters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5inches.
3. Write a C program to display multiplevariables.

Exercise 2:

1. Write a C program to calculate the distance between the twopoints.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrongvalues".

Exercise 3:

1. Write a C program to convert a string to a longinteger.
2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometricalshape.
3. Write a C program to calculate the factorial of a givennumber.

Exercise 4:

1. Write a program in C to display the n terms of even natural number and theirsum.
2. Write a program in C to display the n terms of harmonic series and their sum.
 $1 + 1/2 + 1/3 + 1/4 + 1/5 \dots 1/n$ terms.
3. Write a C program to check whether a given number is an Armstrong number ornot.

Exercise 5:

1. Write a program in C to print all unique elements in anarray.
2. Write a program in C to separate odd and even integers in separatearrays.
3. Write a program in C to sort elements of array in ascendingorder.

Exercise 6:

1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a givenmatrix.

Exercise 7:

1. Write a program in C to search an element in a row wise and column wise sorted matrix.
2. Write a program in C to print individual characters of string in reverseorder.



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Exercise 8:

1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to another string.

Exercise 9:

1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:

1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.
2. Write a program in C to add two numbers using pointers.

Exercise 11:

1. Write a program in C to add numbers using call by reference.
2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:

1. Write a program in C to swap elements using call by reference.
2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13:

1. Write a program in C to show how a function returning pointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc() function.

Exercise 14:

1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc() function. Understand the difference between the above two programs
2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15:

1. Write a program in C to check whether a number is a prime number or not using the function.
2. Write a program in C to get the largest element of an array using the function.

Exercise 16:

1. Write a program in C to append multiple lines at the end of a text file.
2. Write a program in C to copy a file in another name.
3. Write a program in C to remove a file from the disk.

Course Outcomes:**By the end of the Lab, the student**

- 1) Gains Knowledge on various concepts of a C language.
- 2) Able to draw flowcharts and write algorithms.
- 3) Able design and development of C problem solving skills.
- 4) Able to design and develop modular programming skills.
- 5) Able to trace and debug a program



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I Year - I Semester		L	T	P	C
		3	0	0	0
ENVIRONMENTAL SCIENCE					

Learning Objectives:

The objectives of the course are to impart:

- Overall understanding of the natural resources.
- Basic understanding of the ecosystem and its diversity.
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
- An understanding of the environmental impact of developmental activities.
- Awareness on the social issues, environmental legislation and global treaties.

UNIT-I:

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects; Role of information technology in environment and human health.

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT-II:

Natural Resources: Natural resources and associated problems.

Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.

Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.

Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.



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UNIT-III:

Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

UNIT – IV

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his wellbeing.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT – V

Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act - Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Publicawareness.

UNIT – VI

Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics.

The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

Text Books:

1. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
2. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
3. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

Reference:



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1. Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, NewDelhi
3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, NewDelhi
4. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New AgeInternational Publishers,2014



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3
MATHEMATICS - II (Common to all Branch for I Year B. Tech)					

Course Objectives:

- To instruct the concept of Matrices in solving linear algebraic equations
- To elucidate the different numerical methods to solve nonlinear algebraic equations
- To disseminate the use of different numerical techniques for carrying out numerical integration.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Course Outcomes: At the end of the course, the student will be able to

- develop the use of matrix algebra techniques that is needed by engineers for practical applications(L6)
- solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel(L3)
- evaluate approximating the roots of polynomial and transcendental equations by different algorithms(L5)
- apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals(L3)
- apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations(L3)

Unit I: Solving systems of linear equations, Eigen values and Eigenvectors: (10 hrs)

Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non-homogeneous equations linear equations – Gauss Elimination for solving system of equations – Eigen values and Eigen vectors and their properties.

Unit-II: Cayley-Hamilton theorem and Quadratic forms: (10hrs)

Cayley-Hamilton theorem (without proof) – Finding inverse and power of a matrix by Cayley-Hamilton theorem – Reduction to Diagonal form – Quadratic forms and nature of the quadratic forms – Reduction of quadratic form to canonical forms by orthogonal transformation. Singular values of a matrix, singular value decomposition (Ref. Book – 1).

UNIT III: Iterative methods: (8 hrs)



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Introduction – Bisection method – Secant method – Method of false position – Iteration method – Newton-Raphson method (One variable and simultaneous Equations) – Jacobi and Gauss-Seidel methods for solving system of equations.

UNIT IV: Interpolation: (10 hrs)

Introduction – Errors in polynomial interpolation – Finite differences – Forward differences – Backward differences – Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula – Newton's divide difference formula.

UNIT V: Numerical integration and solution of ordinary differential equations: (10 hrs)

Trapezoidal rule – Simpson's $1/3^{\text{rd}}$ and $3/8^{\text{th}}$ rule – Solution of ordinary differential equations by Taylor's series – Picard's method of successive approximations – Euler's method – Runge-Kutta method (second and fourth order).

Text Books:

1. **B. S. Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **B. V. Ramana**, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1. **David Poole**, Linear Algebra- A modern introduction, 4th Edition, Cengage.
2. **Steven C. Chapra**, Applied Numerical Methods with MATLAB for Engineering and Science, Tata Mc. Graw Hill Education.
3. **M. K. Jain, S. R. K. Iyengar and R. K. Jain**, Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
4. **Lawrence Turyn**, Advanced Engineering Mathematics, CRC Press.



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I Year - II Semester		L	T	P	C
		3	0	0	3
MATHEMATICS - III (Common to all Branch for I Year B. Tech)					

Course Objectives:

- To familiarize the techniques in partial differential equations
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

Course Outcomes: At the end of the course, the student will be able to

- interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
- estimate the work done against a field, circulation and flux using vector calculus (L5)
- apply the Laplace transform for solving differential equations (L3)
- find or compute the Fourier series of periodic signals (L3)
- know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)
- identify solution methods for partial differential equations that model physical processes (L3)

Unit – I: Vector calculus: (10 hrs)

Vector Differentiation: Gradient – Directional derivative – Divergence – Curl – Scalar Potential.

Vector Integration: Line integral – Work done – Area – Surface and volume integrals – Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof).

Unit –II: Laplace Transforms: (10 hrs)

Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Unit step function – Dirac's delta function – Inverse Laplace transforms – Convolution theorem (with out proof).

Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.



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Unit –III: Fourier series and Fourier Transforms: (10 hrs)

Fourier Series: Introduction – Periodic functions – Fourier series of periodic function – Dirichlet's conditions – Even and odd functions – Change of interval – Half-range sine and cosine series.

Fourier Transforms: Fourier integral theorem (without proof) – Fourier sine and cosine integrals – Sine and cosine transforms – Properties – inverse transforms – Finite Fourier transforms.

Unit –IV: PDE of first order: (8hrs)

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

UNIT V: Second order PDE and Applications: (10hrs)

Second order PDE: Solutions of linear partial differential equations with constant coefficients – RHS term of the type e^{ax+by} , $\sin(ax+by)$, $\cos(ax+by)$, $x^m y^n$.

Applications of PDE: Method of separation of Variables – Solution of One dimensional Wave, Heat and two-dimensional Laplace equation.

Text Books:

1. **B. S. Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **B. V. Ramana**, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India.
2. **Dean. G. Duffy**, Advanced Engineering Mathematics with MATLAB, 3rd Edition, CRC Press.
3. **Peter O' Neil**, Advanced Engineering Mathematics, Cengage.
4. **Srimantha Pal, S C Bhunia**, Engineering Mathematics, Oxford University Press.



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I Year - II Semester		L	T	P	C
		3	0	0	3
APPLIED PHYSICS					

Course Objectives:

Physics curriculum which is re-oriented to the needs of Circuital branches of graduate engineering courses offered by Jawaharlal Nehru Technological University Kakinada that serves as a transit to understand the branch specific advanced topics. The course is designed to:

- Impart Knowledge of Physical Optics phenomena like Interference and Diffraction required to design instruments with higher resolution.
- Understand the physics of Semiconductors and their working mechanism for their utility insensors.
- To impart the knowledge of materials with characteristic utility inappliances.

UNIT-I

(10hrs)

WAVE OPTICS: Principle of Superposition - Interference of light - Conditions for sustained Interference - Interference in thin films (reflected geometry) - Newton's Rings (reflected geometry).

Diffraction - Fraunhofer Diffraction - Diffraction due to Single slit (quantitative), Double slit, N-slits and circular aperture (qualitative) – Intensity distribution curves - Diffraction Grating – Grating spectrum – missing order – resolving power – Rayleigh's criterion – Resolving powers of Microscope, Telescope and grating(qualitative).

Unit Outcomes:

The students will be able to

- **explain** the need of coherent sources and the conditions for sustained interference.
- **analyze** the differences between interference and diffraction with applications.
- **illustrate** the resolving power of various optical instruments.

UNIT-II

(9hrs)

QUANTUM MECHANICS: Introduction – Matter waves – de Broglie's hypothesis – Davisson-Germer experiment – G. P. Thomson experiment – Heisenberg's Uncertainty Principle – interpretation of wave function – Schrödinger Time Independent and Time Dependent wave equations – Particle in a potential box.



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Unit Outcomes:

The students will be able to

- **explain** the fundamental concepts of quantum mechanics.
- **analyze** the physical significance of wavefunction.
- **apply** Schrödinger's wave equation for energy values of a free particle.

UNIT-III

(10hrs)

FREE ELECTRON THEORY & BAND THEORY OF SOLIDS : Introduction – Classical free electron theory (merits and demerits only) - Quantum Free electron theory – electrical conductivity based on quantum free electron theory – Fermi Dirac distribution function – Temperature dependence of Fermi-Dirac distribution function - expression for Fermi energy - Density of states .

Bloch's theorem (qualitative) – Kronig-Penney model(qualitative) – energy bands in crystalline solids – E Vs K diagram – classification of crystalline solids – effective mass of electron – m^* Vs K diagram - concept of hole.

Unit Outcomes:

The students will be able to

- **explain** the various electron theories.
- **calculate** the Fermi energy.
- **analyze** the physical significance of wave function.
- **interpret** the effects of temperature on Fermi Dirac distribution function.
- **summarise** various types of solids based on band theory.

UNIT-IV

(9hrs)

SEMICONDUCTOR PHYSICS: Introduction – Intrinsic semi conductors - density of charge carriers - Electrical conductivity – Fermi level – extrinsic semiconductors - p-type & n-type - Density of charge carriers - Dependence of Fermi energy on carrier concentration and temperature – Hall effect- Hall coefficient - Applications of Hall effect - Drift and Diffusion currents – Einstein's equation.

Learning Outcomes:

The students will be able to

- **classify** the energy bands of semiconductors.
- **outline** the properties of n-type and p-type semiconductors.
- **identify** the type of semiconductor using Hall effect.



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UNIT-V

(10 hrs)

MAGNETISM & DIELECTRICS: Introduction – Magnetic dipole moment – Magnetization – Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Bohr magneton – Classification of magnetic materials: Dia, para & Ferro – Domain concept of Ferromagnetism - Hysteresis – soft and hard magnetic materials – applications of Ferromagnetic material.

Introduction - Dielectric polarization – Dielectric Polarizability, Susceptibility and Dielectric constant-types of polarizations: Electronic and Ionic (Quantitative), Orientational polarizations (qualitative) – Lorentz Internal field – Claussius-Mossoti equation - Frequency dependence of polarization – Applications of dielectrics.

Unit Outcomes:

The students will be able to

- **explain** the concept of polarization in dielectric materials.
- **summarize** various types of polarization of dielectrics.
- **interpret** Lorentz field and Claussius- Mosotti relation in dielectrics.
- **classify** the magnetic materials based on susceptibility and their temperature dependence.
- **explain** the applications of dielectric and magnetic materials.
- **Apply** the concept of magnetism to magnetic devices.

TEXT BOOKS:

1. “A Text book of Engineering Physics” by M.N. Avadhanulu, P.G.Kshirsagar - S.Chand Publications, 2017.
2. “Engineering Physics” by D.K.Bhattacharya and Poonam Tandon, Oxford press (2015).
3. “Engineering Physics” by R.K Gaur. and S.L Gupta., - Dhanpat Rai publishers, 2012.

REFERENCE BOOKS:

1. “Engineering Physics” by M. R. Srinivasan, New Age international publishers (2009).
2. “Optics” by Ajoy Ghatak, 6th Edition McGraw Hill Education, 2017.
3. “Solid State Physics” by A. J. Dekker, Mc Millan Publishers (2011).



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I Year - II Semester		L	T	P	C
		3	0	0	3
NETWORK ANALYSIS					

UNIT – I

Introduction to Electrical Circuits : Network elements classification, Electric charge and current, Electric energy and potential, Resistance parameter – series and parallel combination, Inductance parameter – series and parallel combination, Capacitance parameter – series and parallel combination. Energy sources: Ideal, Non-ideal, Independent and dependent sources, Source transformation, Kirchoff's laws, Mesh analysis and Nodal analysis problem solving with resistances only including dependent sources also. (Text Books: 1,2,3, Reference Books: 3)

Fundamentals and Network Topology: Definitions of terms associated with periodic functions: Time period, Angular velocity and frequency, RMS value, Average value, Form factor and peak factor- problem solving, Phase angle, Phasor representation, Addition and subtraction of phasors, mathematical representation of sinusoidal quantities, explanation with relevant theory, problem solving. Principal of Duality with examples.

Network Topology: Definitions of branch, node, tree, planar, non-planar graph, incidence matrix, basic tie set schedule, basic cut set schedule. (Text Books: 2,3, Reference Books: 3)

UNIT – II

Transients :First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, Evaluating initial conditions procedure, second order differential equations, homogeneous, non-homogenous, problem solving using R-L-C elements with DC excitation and AC excitation, Response as related to s-plane rotation of roots. Solutions using Laplace transform method. (Text Books: 1,2,3, Reference Books: 1,3)

UNIT – III

Steady State Analysis of A.C Circuits :Impedance concept, phase angle, series R-L, R-C, R-L-C circuits problem solving. Complex impedance and phasor notation for R-L, R-C, R-L-C problem solving using mesh and nodal analysis, Star-Delta conversion, problem solving. (Text Books: 1,2, Reference Books: 3)

Coupled Circuits :Coupled Circuits: Self inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Natural current, Dot rule of coupled circuits, Conductively coupled equivalent circuits- problem solving.

UNIT – IV

Resonance: Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, Condition for maximum impedance, current in anti resonance, Bandwidth of



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parallel resonance, general case-resistance present in both branches, anti resonance at all frequencies. (Text Books:2,3, Reference Books: 3)

Network Theorems: Thevenin's, Norton's, Milliman's, Reciprocity, Compensation, Substitution, Superposition, Max Power Transfer, Tellegens- problem solving using dependent sources also. (Text Books: 1,2,3, Reference Books:2)

UNIT – V

Two-port Networks: Relationship of two port networks, Z-parameters, Y-parameters, Transmission line parameters, h-parameters, Inverse h-parameters, Inverse Transmission line parameters, Relationship between parameter sets, Parallel connection of two port networks, Cascading of two port networks, series connection of two port networks, problem solving including dependent sources also. (Text Books: 1,2, Reference Books: 1,3)

TEXT BOOKS:

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, 3rd Edition, 2000.
2. Network Analysis by K. Satya Prasad and S Sivanagaraju, Cengage Learning
3. Electric Circuit Analysis by Hayt and Kimmarle, TMH

REFERENCES:

1. Network lines and Fields by John. D. Ryder 2nd edition, Asia publishing house.
2. Basic Circuit Analysis by DR Cunningham, Jaico Publishers.
3. Network Analysis and Filter Design by Chadha, Umesh Publications.

COURSE OBJECTIVES:

- To understand the basic concepts on RLC circuits.
- To know the behavior of the steady states and transients states in RLC circuits.
- To know the basic Laplace transforms techniques in periodic waveforms.
- To understand the two port network parameters.
- To understand the properties of LC networks and filters.

COURSE OUTCOME:

- gain the knowledge on basic network elements.
- will analyze the RLC circuits behavior in detail.
- analyze the performance of periodic waveforms.
- gain the knowledge in characteristics of two port network parameters (Z, Y, ABCD, h & g).
- analyze the filter design concepts in real world applications.



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I Year - II Semester		L	T	P	C
		3	0	0	3
BASIC ELECTRICAL ENGINEERING					

Preamble:

This course covers various topics related to principle of operation and performance of various electrical machines.

Course Educational Objectives:

- To understand the principle of operation, constructional details and operational characteristics of DC generators.
- To understand the principle of operation, characteristics of DC motor. Methods of starting and speed control methods of DC motors.
- To learn the constructional details, principle of operation and performance of transformers.
- To study the principle of operation, construction and details of synchronous machines.
- To learn the principle of operation, constructional details, performance, torque – slip characteristics and starting methods of 3-phase induction motors.

Unit I**DC Machines**

Principle of operation of DC generator – emf equation – types of DC machines – torque equation of DC motor – applications – three point starter - losses and efficiency - swinburne's test - speed control methods – OCC of DC generator- Brake test on DC Shunt motor-numerical problems

Unit II**Transformers**

Principle of operation of single phase transformer constructional features – EMF equation – Losses and efficiency of transformer- regulation of transformer – OC & SC tests predetermination of efficiency and regulations – Sumpner's test-Numerical Problems.

Unit III**Synchronous Generators**

Principle of operation and construction of alternators – types of alternators Regulation of alternator by synchronous impedance method-EMF equation of three phase alternator



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Synchronous Motors

Construction of three phase synchronous motor - operating principle –equivalent circuit of synchronous motor.

Unit IV

Induction Machine: Principle of operation and construction of three-phase induction motors – slip ring and squirrel cage motors – slip-torque characteristics – efficiency calculation – starting methods-Brake test on 3-Phase Induction Motor.

Unit V

Special Machines: Principle of operation and construction - single phase induction motor - shaded pole motors – capacitor motors and AC servomotor.

Course Outcomes:

- Able to explain the operation of DC generator and analyze the characteristics of DC generator.
- Able to explain the principle of operation of DC motor and analyze their characteristics. Acquire the skills to analyze the starting and speed control methods of DCmotors.
- Ability to analyze the performance and speed – torque characteristics of a 3-phase induction motor and understand starting methods of 3-phase inductionmotor.
- Able to explain the operation of SynchronousMachines
- Capability to understand the operation of various specialmachines.

TEXT BOOKS:

1. Principles of Electrical Machines by V.K. Mehta & Rohit Mehta, S.Chandpublications
2. Theory & performance of Electrical Machines by J.B.Guptha, S.K.Kataria & Sons

REFERENCE BOOKS:

- 1.Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah, TMH Publications
- 2.Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications, 2nd edition
3. Basic Electrical Engineering by Nagsarkar, Sukhija, Oxford Publications, 2nd edition



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I Year - II Semester		L	T	P	C
		0	0	2	1
ELECTRONIC WORKSHOP					

- I. Identification of components
- II. Laboratory equipment
- III. Soldering practice
- IV. PCB Layout
- V. Testing of Components
- VI. CRO

I. Identification of components:

- Resistors:- Types of Resistors, Value of Resistance using color code, DRBS.
- Capacitors:- Types of capacitors, value of capacitance using color code, DCBS.
- Inductors:- Types of Inductors, DLB
- Rheostats:- Types of Rheostats, Types of potentiometers, Relays.
- Switches:- Types of Switches.
- Cables: Types of Cables.
- Types of Instruments used.

Identification of active elements.

(Two Terminal, Three Terminal Devices)

- (SC diode, Zener diode, D.AC)
- Three Terminal Devices: BJT, UJT, SCR, FET, MOSFET, TRIAC.
- Digital and Analog ICs. (TO and Flat packages) IC regulator types.
- Testing of above components using Multimeters.

II. Laboratory Equipment:

A) Meters:-

- Types of Voltmeters, Types of Ammeters both Analog and Digital.
- Types of Multi meters (Analog & Digital)
- AVO Meters.
- FET input Voltmeter.

B) Laboratory Function Generators and Audio Oscillators.

C) Power Supplies.

D) RF generators.



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E) Different Types of Transformers.
(Power, AF, RF, etc.)

III. Soldering practice

Tools kit including soldering iron

Tools Kit:

- Insulated nose plier
- Insulated cutting plier
- Screw driver kit
- Electrical tester
- Soldering iron, Lead, Flux

IV. PCB layout and Design.

Materials required, centimeter graph sheets, marker.

V. Testing of Components.

Active and Passive Components

VI. CRO

Acquaintance with CRO

Measurements on CRO



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I Year - II Semester		L	T	P	C
		0	0	3	1.5
BASIC ELECTRICAL ENGINEERING LAB					

Learning Objectives:

- To plot the magnetizing characteristics of DC shunt generator and understand the mechanism of self-excitation.
- To control the speed of DC motors.
- To determine and predetermine the performance of DC machines.
- To predetermine the efficiency and regulation of transformers and assess their performance.
- To analyse performance of three phase induction motor.
- To understand the significance of regulation of an alternator using synchronous impedance method.

Any ten of the following experiments are to be conducted

1. Magnetization characteristics of D.C. Shunt generator.
2. Speed control of D.C. shunt motor.
3. Brake test on DC shunt motor.
4. Swinburne's test on DC machine
5. Load test on DC shunt generator
6. Load test on DC series generator.
7. Separation of losses in DC Shunt motor
8. OC & SC tests on single-phase transformer
9. Sumpner's test on single phase transformer
10. Brake test on 3-phase Induction motor.
11. Regulation of alternator by synchronous impedance method.

Learning Outcomes:

The student should be able to:

- Determine and predetermine the performance of DC machines and transformers.
- Control the DC shunt machines.
- Compute the performance of 1-phase transformer.
- Perform tests on 3-phase induction motor and alternator to determine their performance characteristics.



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I Year - II Semester		L	T	P	C
		0	0	3	1.5

APPLIED PHYSIC LAB
(Any 10 of the following listed 15 experiments)

LIST OF EXPERIMENTS:

1. Determination of wavelength of a source-Diffraction Grating-Normalincidence.
2. Newton’s rings – Radius of Curvature of Plano - ConvexLens.
3. Determination of thickness of a spacer using wedge film and parallel interferencefringes.
4. Magnetic field along the axis of a current carrying coil – Stewart and Gee’sapparatus.
5. Energy Band gap of a Semiconductor p - njunction.
6. Characteristics of Thermistor – TemperatureCoefficients
7. Determination of dielectric constant by charging and dischargingmethod
8. Determination of resistivity of semiconductor by Four probemethod.
9. StudythevariationofBversusHbymagnetizingthemagneticmaterial(B-Hcurve). 10
- Measurement of magnetic susceptibility by Gouy’smethod.
11. Dispersive power of diffractiongrating.
12. Resolving Power oftelescope
13. Resolving power ofgrating
14. Determination of Hall voltage and Hall coefficients of a given semiconductor using Hall effect.
15. Variation of dielectric constant withtemperature.



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I Year - II Semester		L	T	P	C
		0	0	2	1
COMMUNICATION SKILLS LAB					

UNIT I:

Oral Activity: JAM, Hypothetical Situations, Self/Peer Profile
 Common Errors in Pronunciation, Neutralising Accent

UNIT II:

Oral Activity: Telephonic Etiquette, Role Plays
 Poster Presentations

UNIT III:

Oral Activity: Oral Presentation skills, Public speaking
 Data Interpretation

UNIT IV:

Oral Activity: Group Discussions: Do's and Don'ts- Types, Modalities

UNIT V:

Oral Activity: Interview Skills: Preparatory Techniques, Frequently asked questions, Mock Interviews.
 Pronunciation: Connected speech (Pausing, Tempo, Tone, Fluency etc..)

References:

1. Infotech English, Maruthi Publications. (with Compact Disc)
2. Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
3. English Pronunciation in use- Mark Hancock, Cambridge University Press.
4. English Phonetics and Phonology-Peter Roach, Cambridge University Press.
5. English Pronunciation in use- Mark Hewings, Cambridge University Press.
6. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
7. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.
8. Technical Communication- Meenakshi Raman, Sangeeta Sharma, Oxford University Press.
9. Technical Communication- Gajendra Singh Chauhan, Smita Kashiramka, Cengage Publications.



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I Year - II Semester		L	T	P	C
		0	0	2	1
ENGINEERING EXPLORATION PROJECT					

COURSE OBJECTIVES:

- Build mindsets & foundations essential for designers
- Learn about the Human-Centered Design methodology and understand their real-world applications
- Use Design Thinking for problem solving methodology for investigating illdefined problems.
- Undergo several design challenges and work towards the final design challenge

Apply Design Thinking on the following Streams to

- Project Stream 1: Electronics, Robotics, IOT and Sensors
- Project Stream 2: Computer Science and IT Applications
- Project Stream 3: Mechanical and Electrical tools
- Project Stream 4: Eco-friendly solutions for waste management, infrastructure, safety, alternative energy sources, Agriculture, Environmental science and other fields of engineering.

HOW TO PURSUE THE PROJECT WORK?

- The first part will be learning-based-asking students to embrace the methodology by exploring all the phases of design thinking through the wallet/ bag challenge and podcasts.
- The second part will be more discussion-based and will focus on building some necessary skills as designers and learning about complementary material for human-centered design.
- The class will then divide into teams and they will be working with one another for about 2 – 3 weeks. These teams and design challenges will be the basis for the final project and final presentation to be presented.
- The teams start with **Design Challenge** and go through all the phases more in depth from coming up with the right question to empathizing to ideating to prototyping and to testing.
- Outside of class, students will also be gathering the requirements, identifying the challenges, usability, importance etc
- At the end, Students are required to submit the final reports, and will be evaluated by the faculty.



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TASKS TO BE DONE:

Task 1: Everyone is a Designer

- Understand class objectives & harness the designermindset

Task 2: The Wallet/Bag Challenge andPodcast

- Gain a quick introduction to the design thinkingmethodology
- Go through all stages of the methodology through a simple designchallenge
- Podcast: Observe, Listen and Engage with the surrounding environment and identify a designchallenge.

Task 3: Teams & Problems

- Start Design Challenge and learn about teams & problems throughthis
- Foster team collaboration, findinspiration from the environment and learn how to identifyproblems

Task 4: Empathizing

- Continue Design Challenge and learnempathy
- Learn techniques on how to empathize withusers
- Go to the field and interview people in theirenvironments
- Submit ActivityCard

Task 5: Ideating

- Continue Design Challenge and learn how to brainstorm effectively
- Encourage exploration and foster spaces forbrainstorming
- Submit ActivityCard

Task 6:Prototyping

- Continue Design Challenge and learn how to create effectiveprototypes
- Build tangible models and use them as communicationtools
- Start giving constructive feedback to classmates andteammates
- Submit Activity Card

Task 7:Testing

- Finish Design Challenge and iterate prototypes and ideas through userfeedback
- Evolve ideas and prototypes through user feedback and constructivecriticism
- Get peer feedback on individual and groupperformance
- Submit ActivityCard

Task8:

- Final Report Submission andPresentation

Note: The colleges may arrange for Guest Speakers from Various Design Fields: Graphic Design, Industrial Design, Architecture, Product Design, Organizational Design, etc to enrich the students with Design ThinkingConcept.



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REFERENCES:

1. Tom Kelly, *The Art of Innovation: Lessons in Creativity From IDEO, America's Leading Design Firm* (Profile Books, 2002)
2. Tim Brown, *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation* (HarperBusiness, 2009)
3. Jeanne Liedtka, Randy Salzman, and Daisy Azer, *Design Thinking for the Greater Good: Innovation in the Social Sector* (Columbia Business School Publishing, 2017)

OTHER USEFUL DESIGN THINKING FRAMEWORKS AND METHODOLOGIES:

- Human-Centered Design Toolkit (IDEO); <https://www.ideo.com/post/design-kit>
- Design Thinking Boot Camp Bootleg (Stanford D-School); <https://dschool.stanford.edu/resources/the-bootcamp-bootleg>
- Collective Action Toolkit (frogdesign); https://www.frogdesign.com/wpcontent/uploads/2016/03/CAT_2.0_English.pdf
- Design Thinking for Educators (IDEO); <https://designthinkingforeducators.com/>



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II Year - I Semester		L	T	P	C
		3	0	0	3
ELECTRONIC DEVICES AND CIRCUITS					

Course Objectives:

The main objectives of this course are

- To learn and understand the basic concepts of semiconductor physics.
- Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes.
- To learn and understand the application of diodes as rectifiers with their operation and characteristics with and without filters are discussed.
- Acquire knowledge about the principle of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics.
- To learn and understand the purpose of transistor biasing and its significance.
- Small signal equivalent circuit analysis of BJT and FET transistor amplifiers and compare different configurations.

UNIT-I: Review of Semi Conductor Physics: Hall effect, continuity equation, law of junction, Fermi Dirac function, Fermi level in intrinsic and extrinsic Semiconductors

Junction Diode Characteristics : energy band diagram of PN junction Diode, Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance.

UNIT-II:

Special Semiconductor Devices: Zener Diode, Breakdown mechanisms, Zener diode applications, LED, Varactor Diode, Photodiode, Tunnel Diode, UJT, PN-PN Diode, SCR. Construction, operation and V-I characteristics.

Rectifiers and Filters: Basic Rectifier setup, half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms, Filters, Inductor filter (Series inductor), Capacitor filter (Shunt inductor), π -Filter, comparison of various filter circuits in terms of ripple factors.

UNIT- III: Transistor Characteristics:

BJT: Junction transistor, transistor current components, transistor equation, transistor configurations, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Ebers-Moll model of a transistor, punch through/reach through, Photo transistor, typical transistor junction voltage values.

FET: FET types, construction, operation, characteristics μ , g_m , r_d parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET.



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UNIT- IV: Transistor Biasing and Thermal Stabilization : Need for biasing, operating point, load line analysis, BJT biasing- methods, basic stability, fixed bias, collector to base bias, self bias, Stabilization against variations in V_{BE} , I_c , and β , Stability factors, (S, S', S'') , Bias compensation, Thermal runaway, Thermal stability.

FET Biasing- methods and stabilization.

UNIT- V: Small Signal Low Frequency Transistor Amplifier Models:

BJT: Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers.

FET: Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers.

Text Books:

1. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition, 2007
2. Electronic Devices and Circuits- K. Lal Kishore, BS Publications, Fourth Edition, 2016.
3. Electronics devices & circuit theory- Robert L. Boylestad and Loui Nashelsky, Pearson/Prentice hall, tenth edition, 2009

References:

1. Integrated Electronics- J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition, 2009
2. Electronic Devices and Integrated Circuits – B.P. Singh, Rekha, Pearson publications,
3. Electronic Devices and Circuits- Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, 4th Edition, 2008.

Course Outcomes:

At the end of this course the student will be able to

- Apply the basic concepts of semiconductor physics.
- Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation.
- Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.
- Understand the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations.
- Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions.
- Perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations.



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II Year - I Semester	L	T	P	C
	3	0	0	3
SWITCHING THEORY and LOGIC DESIGN				

Course Objectives:

- To solve a typical number base conversion and analyze new error coding techniques.
- Theorems and functions of Boolean algebra and behavior of logic gates.
- To optimize logic gates for digital circuits using various techniques.
- Boolean function simplification using Karnaugh maps and Quine-McCluskey methods.
- To understand concepts of combinational circuits.
- To develop advanced sequential circuits.

UNIT – I**REVIEW OF NUMBER SYSTEMS & CODES:**

Representation of numbers of different radix, conversion from one radix to another radix, $r-1$'s complements and r 's complements of signed members. Gray code, 4 bit codes; BCD, Excess-3, 2421, 84-2-1 code etc. Error detection & correction codes: parity checking, even parity, odd parity, Hamming code.

BOOLEAN THEOREMS AND LOGIC OPERATIONS:

Boolean theorems, principle of complementation & duality, De-morgan theorems. Logic operations ; Basic logic operations -NOT, OR, AND, Universal Logic operations, EX-OR, EX-NOR operations. Standard SOP and POS Forms, NAND-NAND and NOR-NOR realizations, Realization of three level logic circuits. Study the pin diagram and obtain truth table for the following relevant ICs 7400,7402,7404,7408,7432,7486.

UNIT – II**MINIMIZATION TECHNIQUES:**

Minimization and realization of switching functions using Boolean theorems, K-Map (up to 6 variables) and tabular method (Quine-mccluskey method) with only four variables and single function.

COMBINATIONAL LOGIC CIRCUITS DESIGN:

Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders; 4-bit adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look-ahead adder circuit, Design code converters using Karnaugh method and draw the complete circuit diagrams.



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UNIT – III

COMBINATIONAL LOGIC CIRCUITS DESIGN USING MSI &LSI :

Design of encoder ,decoder, multiplexer and de-multiplexers, Implementation of higher order circuits using lower order circuits . Realization of Boolean functions using decoders and multiplexers.Design of Priority encoder, 4-bit digital comparator and seven segment decoder. . Study the relevant ICs pin diagrams and their functions 7442,7447,7485,74154.

INTRODUCTION OF PLD's :

PLDs:PROM, PAL, PLA -Basics structures, realization of Boolean functions, Programming table.

UNIT – IV

SEQUENTIAL CIRCUITS I:

Classification of sequential circuits (synchronous and asynchronous) , operation of NAND & NOR Latches and flip-flops; truth tables and excitation tables of RS flip-flop, JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals. Conversion from one flip-flop to another flip-flop. Design of 5ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bi-directional shift register, universal shift, register.

Study the following relevant ICs and their relevant functions 7474,7475,7476,7490,7493,74121.

UNIT – V

SEQUENTIAL CIRCUITS II :

Finite state machine; state diagrams, state tables, reduction of state tables.Analysis of clocked sequential circuits Mealy to Moore conversion and vice-versa.Realization of sequence generator,Design of Clocked Sequential Circuit to detect the given sequence (with overlapping or withoutoverlapping).

TEXT BOOKS:

1. Switching and finite automata theory Zvi.KOHAVI,Niraj.K.Jha 3rdEdition,Cambridge UniversityPress,2009
2. Digital Design by M.MorrisMano,Michael D Ciletti,4th edition PHIpublication,2008
3. Switching theory and logic design by Hill and Peterson,Mc-Graw Hill TMH edition, 2012.



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REFERENCES:

1. Fundamentals of Logic Design by Charles H. Roth Jr, Jaico Publishers, 2006
2. Digital electronics by R S Sedha. S. Chand & company limited, 2010
3. Switching Theory and Logic Design by A. Anand Kumar, PHI Learning pvt ltd, 2016.
4. Digital logic applications and design by John M Yarbough, Cengage learning, 2006.
5. TTL 74-Series databook.

Course Outcomes:

- Classify different number systems and apply to generate various codes.
- Use the concept of Boolean algebra in minimization of switching functions
- Design different types of combinational logic circuits.
- Apply knowledge of flip-flops in designing of Registers and counters
- The operation and design methodology for synchronous sequential circuits and algorithmic state machines.
- Produce innovative designs by modifying the traditional design techniques.



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II Year - I Semester		L	T	P	C
		3	0	0	3
SIGNALS and SYSTEMS					

Course Objectives:

The main objectives of this course are given below:

- To study about signals and systems.
- To analyze the spectral characteristics of signal using Fourier series and Fourier transforms.
- To understand the characteristics of systems.
- To introduce the concept of sampling process.
- To know various transform techniques to analyze the signals and systems.

UNIT- I: INTRODUCTION: Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on signals: time-shifting, time-scaling, amplitude-shifting, amplitude-scaling. Problems on classification and characteristics of Signals and Systems. Complex exponential and sinusoidal signals, Singularity functions and related functions: impulse function, step function, signum function and ramp function. Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, closed or complete set of orthogonal functions, Orthogonality in complex functions. Related Problems.

UNIT –II: FOURIER SERIES AND FOURIER TRANSFORM:

Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Relation between Trigonometric and Exponential Fourier series, Complex Fourier spectrum. Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform. Related Problems.

UNIT-III: ANALYSIS OF LINEAR SYSTEMS: Introduction, Linear system, impulse response, Response of a linear system, Linear time invariant (LTI) system, Linear time variant (LTV) system, Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Transfer function of a LTI system, Related problems. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and rise time.



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UNIT –IV:

CORRELATION: Auto-correlation and cross-correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between Convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering.

SAMPLING THEOREM : Graphical and analytical proof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing, Introduction to Band Pass sampling, Related problems.

UNIT –V:

LAPLACE TRANSFORMS: Introduction, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T's, Inverse Laplace transform, Relation between L.T's, and F.T. of a signal. Laplace transform of certain signals using waveformsynthesis.

Z–TRANSFORMS: Concept of Z- Transform of a discrete sequence. Region of convergence in Z-Transform, constraints on ROC for various classes of signals, Inverse Z-transform, properties of Z-transforms. Distinction between Laplace, Fourier and Z transforms.

TEXT BOOKS:

1. Signals, Systems & Communications - B.P. Lathi, BS Publications,2003.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI,2nd Edn,1997
3. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2ndEdition,2007

REFERENCE BOOKS:

1. Principles of Linear Systems and Signals – BP Lathi, Oxford University Press,2015
2. Signals and Systems – T K Rawat , Oxford University press,2011

Course Outcomes:At the end of this course the student will able to:

- Differentiate the various classifications of signals and systems
- Analyze the frequency domain representation of signals using Fourier concepts
- Classify the systems based on their properties and determine the response of LTI Systems.
- Know the sampling process and various types of sampling techniques.
- Apply Laplace and z-transforms to analyze signals and Systems (continuous & discrete).



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II Year - I Semester		L	T	P	C
		3	0	0	3
RANDOM VARIABLES and STOCHASTIC PROCESSES					

Course Objectives:

- To give students an introduction to elementary probability theory, in preparation to learn the concepts of statistical analysis, random variables and stochastic processes.
- To mathematically model the random phenomena with the help of probability theory Concepts.
- To introduce the important concepts of random variables and stochastic processes.
- To analyze the LTI systems with stationary random process as input.

UNIT I

THE RANDOM VARIABLE: Introduction, Review of Probability Theory, Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional Distribution, Conditional Density, Properties.

UNIT II

OPERATION ON ONE RANDOM VARIABLE - EXPECTATIONS: Introduction, Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic Transformations for a Continuous Random Variable, Non-monotonic Transformations of Continuous Random Variable.

UNIT III

MULTIPLE RANDOM VARIABLES: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem: Unequal Distribution, Equal Distributions.

OPERATIONS ON MULTIPLE RANDOM VARIABLES: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variables case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

UNIT IV

RANDOM PROCESSES – TEMPORAL CHARACTERISTICS: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, Concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second-order and Wide-Sense Stationarity, N^{th} -order and Strict-Sense



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Stationarity, Time Averages and Ergodicity, Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.

UNIT V

RANDOM PROCESSES - SPECTRAL CHARACTERISTICS: The Power Density Spectrum: Properties, Relationship between Power Density Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Density Spectrum and Cross-Correlation Function.

LINEAR SYSTEMS WITH RANDOM INPUTS: Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, Autocorrelation Function of Response, Cross-Correlation Functions of Input and Output, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectra of Input and Output, Band pass, Band-Limited and Narrowband Processes, Properties.

TEXT BOOKS:

1. Probability, Random Variables & Random Signal Principles, Peyton Z. Peebles, TMH, 4th Edition, 2001.
2. Probability, Random Variables and Stochastic Processes, Athanasios Papoulis and S. Unnikrishna, PHI, 4th Edition, 2002.
3. Probability and Random Processes with Applications to Signal Processing, Henry Stark and John W. Woods, Pearson Education, 3rd Edition, 2001.

REFERANCE BOOKS:

1. Schaum's Outline of Probability, Random Variables, and Random Processes, 1997.
2. An Introduction to Random Signals and Communication Theory, B.P. Lathi, International Textbook, 1968.
3. Probability Theory and Random Processes, P. Ramesh Babu, McGrawHill, 2015.

Course Outcomes:

After completion of the course, the student will be able to

- Mathematically model the random phenomena and solve simple probabilistic problems.
- Identify different types of random variables and compute statistical averages of these random variables.
- Characterize the random processes in the time and frequency domains.
- Analyze the LTI systems with random inputs.



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II Year - I Semester		L	T	P	C
		3	0	0	3
OBJECT ORIENTED PROGRAMMING THROUGH JAVA					

Course Objectives:

This subject will help to improve

- the analytical skills of object oriented programming
- Overall development of problem solving and critical analysis.
- Formal introduction to Java programming language

Course Outcomes:

On successful completion of this course, the student should be able to:

- Show competence in the use of the Java programming language in the development of small to medium-sized application programs that demonstrate professionally acceptable coding and performance standard
- Illustrate the basic principles of the object-oriented programming
- Demonstrate an introductory understanding of graphical user interfaces, multithreaded programming, and event-driven programming.

Unit I

Introduction to Java : Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java.

Objects and Classes : Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, StringBuffer, File, this reference.

Unit II

Inheritance and Polymorphism : Inheritance in java, Super and sub class, Overriding, Object class, Polymorphism, Dynamic binding, Generic programming, Casting objects, Instance of operator, Abstract class, Interface in java, Package in java, UTIL package.

Unit III

Event and GUI programming : Event handling in java, Event types, Mouse and key events, GUI Basics, Panels, Frames, Layout Managers: Flow Layout, Border Layout, Grid Layout, GUI components like Buttons, Check Boxes, Radio Buttons, Labels, Text Fields, Text Areas, Combo Boxes, Lists, Scroll Bars, Sliders, Windows, Menus, Dialog Box, Applet and its life cycle, Introduction to swing, Creating a swing applet, swing controls and components.

Unit IV

I/O programming: Text and Binary I/O, Binary I/O classes, Object I/O, Random Access Files. Event driven model, handling events



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Unit V

Multithreading in java: Thread life cycle and methods, Runnable interface, Thread synchronization, Exception handling with try-catch-finally, Collections in java, Introduction to JavaBeans and Network Programming.

Text Books:

- 1) Introduction to Java Programming (Comprehensive Version), Daniel Liang, Seventh Edition, Pearson.
- 2) Programming in Java, Sachin Malhotra & Saurabh Chaudhary, Oxford University Press.

Reference Books:

- 1) Murach's Beginning Java 2, Doug Lowe, Joel Murach and Andrea Steelman, SPD.
- 2) Core Java Volume-I Fundamentals, Eight Edition, Horstmann & Cornell, Pearson Education.
- 3) The Complete Reference, Java 2 (Fourth Edition), Herbert Schild, TMH.
- 4) Java Programming, D. S. Malik, Cengage Learning.



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II Year - I Semester		L	T	P	C
		3	0	0	3
MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS					

Course Objectives:

- The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting.
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis.
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles.
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation.
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals.

Unit-I**Introduction to Managerial Economics and demand Analysis:**

Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

Unit – II:**Theories of Production and Cost Analyses:**

Theories of Production function- Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

Unit – III:**Introduction to Markets, Theories of the Firm & Pricing Policies:**

Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson’s models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles : Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms.



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Unit – IV:

Introduction to Accounting & Financing Analysis:

Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis (Problems)

Unit – V:

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(pay back period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

TEXT BOOKS:

1. A R Aryasri, Managerial Economics and Financial Analysis, The McGraw – Hill companies.

REFERENCES:

1. Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & CompanyLtd,
2. JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New editionedition
3. N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & CompanyLtd,
4. MaheswariS.N,AnIntroduction to Accountancy, Vikas Publishing House PvtLtd
5. I.M Pandey, Financial Management , Vikas Publishing House PvtLtd
6. V. Maheswari, Managerial Economics, S. Chand & CompanyLtd.

Course Outcomes:

- The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for aproduct.
- The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination ofinputs.
- The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different BusinessUnits.
- The Learner is able to prepare Financial Statements and the usage of various Accounting tools forAnalysis.
- The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decisionmaking.



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II Year - I Semester		L	T	P	C
		0	0	3	1.5
ELECTRONIC DEVICES AND CIRCUITS LAB					

Note: The students are required to perform the experiment to obtain the V-I characteristics and to determine the relevant parameters from the obtained graphs.

Electronic Workshop Practice:

1. Identification, Specifications, Testing of R, L, C Components (ColourCodes), Potentiometers, Coils, Gang Condensers, Relays, BreadBoards.
2. Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs, LEDs, LCDs, SCR, UJT.
3. Soldering Practice- Simple circuits using active and passive components.
4. Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital Multimeter, Function Generator, Regulated Power Supply and CRO.

List of Experiments: (Minimum of Ten Experiments has to be performed)

1. P-N Junction Diode Characteristics
 Part A: Germanium Diode (Forward bias & Reverse bias)
 Part B: Silicon Diode (Forward Bias only)
2. Zener Diode Characteristics
 Part A: V-I Characteristics
 Part B: Zener Diode as Voltage Regulator
3. Rectifiers (without and with filter)
 Part A: Half-wave Rectifier
 Part B: Full-wave Rectifier
4. BJT Characteristics (CE Configuration)
 Part A: Input Characteristics
 Part B: Output Characteristics
5. FET Characteristics (CS Configuration)
 Part A: Drain Characteristics
 Part B: Transfer Characteristics
6. SCR Characteristics
7. UJT Characteristics
8. Transistor Biasing
9. CRO Operation and its Measurements
10. BJT-CE Amplifier
11. Emitter Follower-CC Amplifier
12. FET-CS Amplifier

Equipment required:

1. Regulated Power supplies



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2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multi-meters
5. Decade Resistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components



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II Year - I Semester		L	T	P	C
		0	0	3	1.5
SWITCHING THEORY and LOGIC DESIGN LAB					

List of Experiments: (Minimum of Twelve Experiments has to be performed)

1. Verification of truth tables of Logicgates
Two input (i) OR (ii) AND (iii) NOR (iv) NAND (v) Exclusive OR (vi) Exclusive NOR
2. Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital TrainerKit
3. Verification of functional table of 3 to 8 line Decoder /De-multiplexer
4. 4 variable logic function verification using 8 to 1 multiplexer.
5. Design full adder circuit and verify its functionaltable.
6. Verification of functional tables of
 - (i) J K Edge triggered Flip –Flop
 - (ii) J K Master Slave Flip – Flop
 - (iii) D Flip -Flop
7. Design a four bit ring counter using D Flip – Flops / JK Flip Flop and verify output
8. Design a four bit Johnson’s counter using D Flip-Flops / JK Flip Flops and verify output
9. Verify the operation of 4-bit Universal Shift Register for different Modes of operation.
10. Draw the circuit diagram of MOD-8 ripple counter and construct a circuit using T-Flip-Flops and Test it with a low frequency clock and Sketch the output waveforms.
11. Design MOD – 8 synchronous counter using T Flip-Flop and verify the result and Sketch the output waveforms.
12. (a) Draw the circuit diagram of a single bit comparator and test the output
(b) Construct 7 Segment Display Circuit Using Decoder and 7 Segment LED and test it.

ADD on Experiments:

1. Design BCD Adder Circuit and Test the Same using Relevant IC
2. Design Excess-3 to 9-Complement convertor using only four Full Adders and test the Circuit.
3. Design an Experimental model to demonstrate the operation of 74154 De-Multiplexer using LEDs for outputs.



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II Year-I Semester		L	T	P	C
		3	0	0	0
CONSTITUTION OF INDIA					

Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative.

UNIT-I

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Learning outcomes:

After completion of this unit student will

- Understand the concept of Indian constitution
- Apply the knowledge on directive principle of state policy
- Analyze the History, features of Indian constitution
- Evaluate Preamble Fundamental Rights and Duties

UNIT-II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre-State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions;

Learning outcomes:- After completion of this unit student will

- Understand the structure of Indian government
- Differentiate between the state and central government
- Explain the role of President and Prime Minister
- Know the Structure of supreme court and High court



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UNIT-III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organization, Structure and Functions

Learning outcomes:-After completion of this unit student will

- Understand the structure of state government
- Analyze the role Governor and Chief Minister
- Explain the role of state Secretariat
- Differentiate between structure and functions of state secretariat

UNIT-IV

A. Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation Panchayati Raj: Functions PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy

Learning outcomes:-After completion of this unit student will

- Understand the local Administration
- Compare and contrast district administration role and importance
- Analyze the role of Mayor and elected representatives of Municipalities
- Evaluate Zilla Panchayat block level organization

UNIT-V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

Learning outcomes:-After completion of this unit student will

- Know the role of Election Commission apply knowledge
- Contrast and compare the role of Chief Election commissioner and Commissionerate
- Analyze role of state election commission
- Evaluate various commissions of viz SC/ST/OBC and women

References:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi
2. Subash Kashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics
4. D.C. Gupta, Indian Government and Politics



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5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government and Politics Hans
7. J. Raj Indian Government and Politics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

resources:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

Course Outcomes:

At the end of the semester/course, the student will be able to have a clear knowledge on the following:

- Understand historical background of the constitution making and its importance for building a democratic India.
- Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
- Understand the value of the fundamental rights and duties for becoming good citizen of India.
- Analyze the decentralization of power between central, state and local self-government.
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.
 1. Know the sources, features and principles of Indian Constitution.
 2. Learn about Union Government, State government and its administration.
 3. Get acquainted with Local administration and Pachayati Raj.
 4. Be aware of basic concepts and developments of Human Rights.
 5. Gain knowledge on roles and functioning of Election Commission



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II Year-II Semester		L	T	P	C
		3	0	0	3
ELECTRONIC CIRCUIT ANALYSIS					

Course Objectives:

The main objectives of this course are:

- To learn hybrid-pi parameters at high frequency and compare with low frequency parameters.
- Learn and understand the purpose of cascading of single stage amplifiers and derive the overall voltage gain.
- Analyze the effect of negative feedback on amplifier characteristics and derive the characteristics.
- Learn and understand the basic principle of oscillator circuits and perform the analysis of different oscillator circuits.
- Compare and analyze different Power amplifiers like Class A, Class B, Class C, Class AB and other types of amplifiers.
- Analyze different types of tuned amplifier circuits.

UNIT-I Small Signal High Frequency Transistor Amplifier models:

BJT: Transistor at high frequencies, Hybrid- π common emitter transistor model, Hybrid π conductance, Hybrid π capacitances, validity of hybrid π model, determination of high-frequency parameters in terms of low-frequency parameters, CE short circuit current gain, current gain with resistive load, cut-off frequencies, frequency response and gain bandwidth product.

FET: Analysis of common Source and common drain Amplifier circuits at high frequencies.

UNIT-II

Multistage Amplifiers: Classification of amplifiers, methods of coupling, cascaded transistor amplifier and its analysis, analysis of two stage RC coupled amplifier, high input resistance transistor amplifier circuits and their analysis-Darlington pair amplifier, Cascode amplifier, Boot-strap emitter follower, Differential amplifier using BJT.

UNIT -III

Feedback Amplifiers : Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, Characteristics of negative feedback amplifiers, Generalized analysis of feedback amplifiers, Performance comparison of feedback amplifiers, Method of analysis of feedback amplifiers.



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Unit-IV

Oscillators: Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and Wien bridge oscillators with BJT and FET and their analysis, Generalized analysis of LC Oscillators, Hartley and Colpitt's oscillators using BJT, Frequency and amplitude stability of oscillators.

UNIT-V

Power Amplifiers: Classification of amplifiers(A to H), Class A power Amplifiers, Class B Push-pull amplifiers, Complementary symmetry push pull amplifier, Class AB power amplifier, Class-C power amplifier, Thermal stability and Heatsinks.

Tuned Amplifiers: Introduction, Q-Factor, small signal tuned amplifier, capacitance single tuned amplifier, double tuned amplifiers, , staggered tuned amplifiers

Text Books:

1. Integrated Electronics- J. Millman and C.C. Halkias, Tata McGraw-Hill, 1972.
2. Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, Tenth Edition, 2009.
3. Electronic Devices and Integrated Circuits – B.P. Singh, Rekha , Pearson publications, 2006

References:

1. Electronic Circuit Analysis and Design – Donald A. Neaman, McGrawHill, 2010.
2. Microelectronic Circuits-Sedra A.S. and K.C. Smith, Oxford University Press, Sixth Edition, 2011.
3. Electronic Circuit Analysis-B.V.Rao, K.R.Rajeswari, P.C.R.Pantulu, K.B.R.Murthy, Pearson Publications.

Course Outcomes:

At the end of this course the student can able to

- Design and analysis of small signal high frequency transistor amplifier using BJT and FET.
- Design and analysis of multistage amplifiers using BJT and FET and Differential amplifier using BJT.
- Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept.
- Know the classification of the power and tuned amplifiers and their analysis with performance comparison.



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II Year-II Semester		L	T	P	C
		3	0	0	3
LINEAR CONTROL SYSTEMS					

Course objectives:

- To introduce the concepts of open loop and closed loop systems, mathematical models of mechanical and electrical systems, and concepts of feedback
- To study the characteristics of the given system in terms of the transfer function and introducing various approaches to reduce the overall system for necessary analysis
- To develop the acquaintance in analyzing the system response in time-domain and frequency domain in terms of various performance indices
- To analyze the system in terms of absolute stability and relative stability by different approaches
- To design different control systems for different applications as per given specifications
- To introduce the concepts of state variable analysis, design and also the concepts of controllability and observability.

UNIT I**INTRODUCTION**

Concepts of System, Control Systems: Open Loop and closed loop control systems and their differences. Different examples of control systems, Feed-Back Characteristics, Effects of feedback. Mathematical models, Differential equations, Impulse Response and transfer functions. Translational and Rotational mechanical systems

UNIT II**TRANSFER FUNCTION REPRESENTATION**

Transfer Function of DC Servo motor - AC Servo motor- Synchro-transmitter and Receiver, Block diagram representation of systems considering electrical systems as examples -Block diagram algebra- Representation by Signal flow graph - Reduction using mason's gain formula.

TIME RESPONSE ANALYSIS

Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants.

UNIT III**STABILITY ANALYSIS IN S-DOMAIN**

The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability

Root Locus Technique:

The root locus concept - construction of root loci-effects of adding poles and zeros to $G(s)H(s)$ on the root loci.



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UNIT IV

Frequency response analysis: Introduction, Correlation between time and frequency response, Polar Plots, Bode Plots, Nyquist Stability Criterion

UNIT V

CLASSICAL CONTROL DESIGN TECHNIQUES

Compensation techniques – Lag, Lead, Lead-Lag Controllers design in frequency Domain, PID Controllers. State Space Analysis of Continuous Systems Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and its Properties – Concepts of Controllability and Observability.

TEXT BOOKS:

1. Automatic Control Systems 8th edition– by B. C. Kuo–John Wiley and Sons's, 2003.
2. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 2nd edition, 2007
3. Modern Control Engineering–by Katsuhiko Ogata – Pearson Publications, 5th edition, 2015.

REFERENCE BOOKS:

1. Control Systems by A. Nagoorkani, RBA publications, 3rd edition, 2017.
2. Control Systems by A. Anandkumar, PHI, 2nd Edition, 2014.

Course Outcomes:

- This course introduces the concepts of feedback and its advantages to various control systems
- The performance metrics to design the control system in time-domain and frequency domain are introduced.
- Control systems for various applications can be designed using time-domain and frequency domain analysis.
- In addition to the conventional approach, the state space approach for the analysis of control systems is also introduced.



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II Year-II Semester		L	T	P	C
		3	0	0	3
ELECTROMAGNETIC WAVES and TRANSMISSION LINES					

Course objectives:

The main objectives of this course are to understand

- Fundamentals of steady electric and magnetic fields using various laws
- Apply the concept of static and time varying Maxwell equations and power flow using Poynting theorem
- Wave characteristics in different media for normal and oblique incidence
- Implement various concepts of transmission lines and impedance measurements

SYLLABUS:

Prerequisites: Understanding of Cartesian co-ordinates, spherical & cylindrical systems

UNIT I:

Transmission Lines - I : Types, Parameters, T & π Equivalent Circuits, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line, Lossless lines, distortion less lines, Illustrative Problems.

UNIT II:

Transmission Lines – II: Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. Low loss radio frequency lines and UHF Transmission lines, UHF Lines as Circuit Elements; Impedance Transformations, $\lambda/8$, $\lambda/4$ and $\lambda/2$ Lines – Smith Chart – Construction and Applications, Quarter wave transformer, Single Stub Matching, Illustrative Problems.

UNIT III:

Review of Co-ordinate Systems, **Electrostatics**:, Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss Law and Applications, Electric Potential, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Illustrative Problems. Convection and Conduction Currents, Dielectric Constant, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial Capacitors, Illustrative Problems.

UNIT IV:

Magneto Statics : Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Inductances and Magnetic Energy. Illustrative Problems.

Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements. Conditions at a Boundary Surface. Illustrative Problems.

UNIT V:

EM Wave Characteristics : Wave Equations for Conducting and Perfect Dielectric Media,



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II Year-II Semester		L	T	P	C
		3	0	0	3
ANALOG COMMUNICATIONS					

Course Objectives:

Students undergoing this course are expected to

- Familiarize with the fundamentals of analog communications systems.
- Familiarize with various techniques for analog modulation and demodulation of signals.
- Distinguish the figure of merits of various analog modulation methods.
- Develop the ability to classify and understand various functional blocks of radio transmitters and receivers.
- Familiarize with basic techniques for generating and demodulating various pulse modulated signals.

UNIT I

AMPLITUDE MODULATION : Introduction to communication system, Need for modulation, Frequency Division Multiplexing , Amplitude Modulation, Definition, Time domain and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves, square law Modulator, Switching modulator, Detection of AM Waves; Square law detector, Envelope detector.

UNIT II

DSB & SSB MODULATION: Double side band suppressed carrier modulators, time domain and frequency domain description, Generation of DSBSC Waves, Balanced Modulators, Ring Modulator, Coherent detection of DSB-SC Modulated waves, COSTAS Loop. Frequency domain description, Frequency discrimination method for generation of AM SSB Modulated Wave, Time domain description, Phase discrimination method for generating AM SSB Modulated waves. Demodulation of SSB Waves, Vestigial side band modulation: Frequency description, Generation of VSB Modulated wave, Time domain description, Envelope detection of a VSB Wave pulse Carrier, Comparison of AM Techniques, Applications of different AM Systems, FDM.

UNIT III

ANGLE MODULATION: Basic concepts, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Waves, Detection of FM Waves: Balanced Frequency discriminator, Zero crossing detector, Phase locked loop. Comparison of FM & AM.



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UNIT IV

TRANSMITTERS & RECEIVERS: Radio Transmitter - Classification of Transmitter, AM Transmitter, Effect of feedback on performance of AM Transmitter, FM Transmitter – Variable reactance type and phase modulated FM Transmitter, frequency stability in FM Transmitter. **Radio Receiver** - Receiver Types - Tuned radio frequency receiver, Super hetro dyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, AGC, FM Receiver, Comparison with AM Receiver, Amplitude limiting. Communication Receivers, extensions of super heterodyne principle and additional circuits.

UNIT V

NOISE: Review of noise and noise sources, noise figure, Noise in Analog communication Systems, Noise in DSB& SSB System, Noise in AM System, Noise in Angle Modulation Systems, Threshold effect in Angle Modulation System, Pre-emphasis & de-emphasis

PULSE MODULATION: Types of Pulse modulation, PAM (Single polarity, double polarity) PWM: Generation & demodulation of PWM, PPM, Generation and demodulation of PPM, Time Division Multiplexing, TDM Vs FDM

TEXT BOOKS:

1. Principles of Communication Systems – H Taub & D. Schilling, Gautam Sahe, TMH, 3rd Edition, 2007.
2. Principles of Communication Systems - Simon Haykin, John Wiley, 2nd Edition, 2007.
3. Modern Digital and Analog Communication Systems –B.P.Lathi, Zhi Ding, Hari Mohan Gupta, Oxford University Press, 4th Edition, 2017

REFERENCES:

1. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.
2. Communication Systems– R.P. Singh, SP Sapre, Second Edition TMH, 2007.
3. Electronic Communication systems – Tomasi, Pearson, fourth Edition, 2007.

Course Outcomes:

After undergoing the course, students will be able to

- Differentiate various Analog modulation and demodulationschemes and their spectralcharacteristics
- Analyze noise characteristics of various analog modulationmethods
- Analyze various functional blocks of radio transmitters andreceivers
- Design simple analog systems for various modulationtechniques.



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II Year-II Semester		L	T	P	C
		3	0	0	3
COMPUTER ARCHITECTURE and ORGANIZATION					

Course objectives:

- To understand the architecture of a modern computer with its various processing units. Also the Performance measurement of the computer system.
- To understand the memory management system of computer.
- To Understand the various instructions, addressing modes
- To Understand the concept of I/O organization

UNIT -I:

Basic Structure Of Computers: Functional unit, Basic Operational concepts, Bus structures, System Software, Performance, The history of computer development.

Machine Instruction and Programs:

Instruction and Instruction Sequencing: Register Transfer Notation, Assembly Language Notation, Basic Instruction Types,

UNIT -II:

Addressing Modes, Basic Input/output Operations, The role of Stacks and Queues in computer programming equation. Component of Instructions: Logic Instructions, shift and Rotate Instructions

Type of Instructions: Arithmetic and Logic Instructions, Branch Instructions, Addressing Modes, Input/output Operations

UNIT -III:

INPUT/OUTPUT ORGANIZATION: Accessing I/O Devices, Interrupts: Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access,

Buses: Synchronous Bus, Asynchronous Bus, Interface Circuits, Standard I/O Interface: Peripheral Component Interconnect (PCI) Bus, Universal Serial Bus (USB)

UNIT -IV:

The MEMORY SYSTEMS: Basic memory circuits, Memory System Consideration, Read-Only Memory: ROM, PROM, EPROM, EEPROM, Flash Memory,

Cache Memories: Mapping Functions, INTERLEAVING

Secondary Storage: Magnetic Hard Disks, Optical Disks,

UNIT -V:

Processing Unit: Fundamental Concepts: Register Transfers, Performing an Arithmetic Or



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Logic Operation, Fetching A Word From Memory, Execution of Complete Instruction, Hardwired Control,

Micro programmed Control: Microinstructions, Micro program Sequencing, Wide Branch Addressing Microinstructions with next –Address Field

TEXTBOOKS:

1. Computer Organization, Carl Hamacher, Zvonks Vranesic, Safea Zaky, 5th Edition, McGraw Hill, 2011.
2. Computer Architecture and Organization, John P. Hayes, 3rd Edition, McGraw Hill, 2002.

REFERENCE BOOKS:

1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI/Pearson, 2012.
3. Fundamentals of Computer Organization and Design, - Sivarama Dandamudi Springer Int. Edition, 2003.
4. “Computer Organization and Design: The Hardware/Software Interface” by David A. Patterson and John L. Hennessy, 1998.
5. J. P. Hayes, "Computer Architecture and Organization", McGraw-Hill, 1998.

Course Outcomes:

- Students can understand the architecture of modern computer.
- They can analyze the Performance of a computer using performance equation
- Understanding of different instruction types.
- Students can calculate the effective address of an operand by addressing modes
- They can understand how computer stores positive and negative numbers.
- Understand the concepts of I/O Organization and Memory systems.



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II Year-II Semester	L	T	P	C
	3	0	0	3
MANAGEMENT and ORGANISATIONAL BEHAVIOUR				

Course Objectives:

- To familiarize with the process of management, principles, leadership styles and basic concepts on Organization.
- To provide conceptual knowledge on functional management that is on Human resource management and Marketing management.
- To provide basic insight into select contemporary management practices and Strategic Management.
- To learn theories of motivation and also deals with individual behavior, their personality and perception of individuals.
- To understand about organizations groups that affect the climate of an entire organizations which helps employees in stress management.

Unit I

Introduction: Management and organizational concepts of management and organization- Nature and Importance of Management, Functions of Management, System approach to Management - Taylor's Scientific Management Theory, Fayol's Principles of Management, Leadership Styles, Social responsibilities of Management. Designing Organizational Structures: Basic concepts related to Organization - Departmentation and Decentralization, MBO, Process and concepts.

Unit II

Functional Management: Human Resource Management (HRM) Concepts of HRM, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Wage and Salary Administration Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating. - Marketing Management: Concepts of Marketing, Marketing mix elements and marketing strategies.

Unit III

Strategic Management: Strategic Management and Contemporary Strategic Issues: Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and implementation, Generic Strategy alternatives. Bench Marking and Balanced Score Card as Contemporary Business Strategies.

Unit IV

Individual Behavior: Perception-Perceptual process- Impression management- Personality development – Socialization – Attitude- Process- Formation- Positive attitude- Change – Learning – Learning organizations- Reinforcement Motivation – Process- Motives – Theories of



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Motivation: Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation,

Unit V

Group Dynamics: Types of Groups, Stages of Group Development, Group Behaviour and Group Performance Factors, Organizational conflicts: Reasons for Conflicts, Consequences of Conflicts in

Organization, Types of Conflicts, Strategies for Managing Conflicts, Organizational Climate and Culture, Stress, Causes and effects, coping strategies of stress.

Reference Books:

1. Subba Rao P., *Organizational Behaviour*, Himalaya Publishing House. Mumbai.
2. Fred Luthans *Organizational Behaviour*, TMH, New Delhi.
3. Robins, Stephen P., *Fundamentals of Management*, Pearson, India.
4. Kotler Philip & Keller Kevin Lane: *Marketing Management* 12/e, PHI, 2007
5. Koontz & Weihrich: *Essentials of Management*, 6/e, TMH, 2007
6. Kanishka Bedi, *Production and Operations Management*, Oxford University Press, 2007.

Course Outcomes:

- After completion of the Course the student will acquire the knowledge on management functions, global leadership and organizational structure.
- Will familiarize with the concepts of functional management that is HRM and Marketing of new product developments.
- The learner is able to think in strategically through contemporary management practices.
- The learner can develop positive attitude through personality development and can equip with motivational theories.
- The student can attain the group performance and grievance handling in managing the organizational culture.



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II Year-II Semester		L	T	P	C
		0	0	3	1.5
ELECTRONIC CIRCUIT ANALYSIS LAB					

Note: The students are required to design the circuit and perform the simulation using Multisim/ Equivalent Industrial Standard Licensed simulation software tool. Further they are required to verify the result using necessary hardware equipment.

List of Experiments :(Minimum of Ten Experiments has to be performed)

1. Determination of f_T of a given transistor.
2. Voltage-Series Feedback Amplifier
3. Current-Shunt Feedback Amplifier
4. RC Phase Shift/Wien Bridge Oscillator
5. Hartley/ Colpitt's Oscillator
6. Two Stage RC Coupled Amplifier
7. Darlington Pair Amplifier
8. Bootstrapped Emitter Follower
9. Class A Series-fed Power Amplifier
10. Transformer-coupled Class A Power Amplifier
11. Class B Push-Pull Power Amplifier
12. Complementary Symmetry Class B Push-Pull Power Amplifier
13. Single Tuned Voltage Amplifier
14. Double Tuned Voltage Amplifier

Equipment required:

Software:

- i. Multisim/ Equivalent Industrial Standard Licensed simulation software tool.
- ii. Computer Systems with required specifications

Hardware Required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Resistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components



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II Year-II Semester		L	T	P	C
		0	0	3	1.5
ANALOG COMMUNICATIONS LAB					

List of Experiments:

(Twelve experiments to be done- **The students have to calculate the relevant parameters**)–

- (a. Hardware, b. MATLAB Simulink, c. MATLAB Communication toolbox)
- A. Amplitude Modulation - Modulation & Demodulation
 - B. AM - DSB SC - Modulation & Demodulation
 - C. Spectrum Analysis of Modulated signal using Spectrum Analyzer
 - D. Diode Detector
 - E. Pre-emphasis & De-emphasis
 - F. Frequency Modulation - Modulation & Demodulation
 - G. AGC Circuits
 - H. Verification of Sampling Theorem
 - I. Pulse Amplitude Modulation & Demodulation
 - J. PWM, PPM – Modulation & Demodulation
 - K. PLL IC-565 as FM demodulator
 - L. Radio receiver characteristics
 - M. Radio Receiver/TV Receiver Demo kits or Trainees.

Note: All the above experiments are to be executed/completed using hardware boards and also to be simulated on Mat lab.

Equipment & Software required:

Software :

- i) Computer Systems with latest specifications
- ii) Connected in LAN (Optional)
- iii) Operating system (Windows/Linux software)
- iv) Simulations software (Simulink & MATLAB)

Equipment:

1. RPS - 0 – 30V
2. CRO - 0 – 20 M Hz.
3. Function Generators - 0 – 1 MHz
4. Components and Breadboards
5. Multimeters and other meters
6. Spectrum Analyzer



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III Year - I Semester		L	T	P	C
		3	0	0	3
LINEAR INTEGRATED CIRCUITS and APPLICATIONS					

Course objectives::

- To understand the basic operation & performance parameters of differential amplifiers.
- To understand & learn the measuring techniques of performance parameters of Op-Amp
- To learn the linear and non-linear applications of operational amplifiers.
- To understand the analysis & design of different types of active filters using op-amps
- To learn the internal structure, operation and applications of different analog ICs
- To Acquire skills required for designing and testing integrated circuits

UNIT I

Introduction: Internal Block Diagram of various stages of Op-Amp and Roll of each Stage. Differential Amplifier using BJTs and With R_E DC and AC Analysis, Basic Current Mirror Circuit, Improved Version of current mirror circuit, current repeated circuit, Wilson current source.

OP-Amp Block Diagram (Symbolic Representation), Characteristics of Op-Amp, Ideal and Practical Op-Amp specifications, DC and AC Characteristics, Definitions of Input and Output Off-set voltage and currents slow rate, CMRR, PSRR.etc, Measurements of Op-Amp Parameters. Three-Terminal Voltage Regulators 78xx & 79xx Series, current Booster, adjustable voltage, Dual Power Supply with 78xx & 79xx.

UNIT II

LINEAR and NON-LINEAR APPLICATIONS OF OP-AMPS: Inverting and Non-inverting amplifier, Integrator and differentiator, Difference amplifier, Instrumentation amplifier, AC amplifier, V to I, I to V converters, Buffers. Non-Linear function generation, Comparators, Multivibrators, Triangular and Square wave generators, Log and Anti log Amplifiers, Precision rectifiers.

UNIT III

ACTIVE FILTERS, ANALOG MULTIPLIERS AND MODULATORS: Design & Analysis of Butterworth active filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters.

Four Quadrant Multiplier, IC 1496, Sample & Hold circuits.

UNIT IV

TIMERS & PHASE LOCKED LOOPS: Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger; PLL - introduction, block schematic, principles and description of individual blocks, 565 PLL, Applications of PLL – frequency multiplication, frequency translation, AM, FM & FSK demodulators. Applications of VCO (566).



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UNIT V

DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs – parallel Comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC. DAC and ADC Specifications, Specifications AD 574 (12 bit ADC).

TEXT BOOKS:

1. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p)Ltd, 2ndEdition,2003.
2. Op-Amps & Linear ICs - Ramakanth A. Gayakwad,PHI,1987.
3. Linear Integrated Circuits by Salivahan-3rd-Edition, McGrawHill,2018

REFERENCES:

1. Operational Amplifiers & Linear Integrated Circuits –Sanjay Sharma ;SK Kataria& Sons; 2ndEdition,2010
2. Operational Amplifiers & Linear Integrated Circuits–R.F.Coughlin& FredrickDriscoll, PHI, 6th Edition,2000.
3. Operational Amplifiers & Linear ICs – David A Bell, Oxford Uni. Press, 3rd Edition,2011.
4. LinearIntegratedCircuits,byGaneshBabuT.RandSuseelaB.Scitech, 5th-Editon, 2014.

Course Outcomes:

- Design circuits using operational amplifiers for various applications.
- Analyze and design amplifiers and active filters using Op-amp.
- Diagnose and trouble-shoot linear electronic circuits.
- Understand the gain-bandwidth concept and frequency response of the amplifier configurations.
- Understand thoroughly the operational amplifiers with linear integrated circuits.



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Programmers Model – Modes of operation and execution, Instruction set summary, System address map, write buffer, bit-banding, processor core register summary, exceptions.

ARM Cortex-M3 programming – Software delay, Programming techniques, Loops, Stack and Stack pointer, subroutines and parameter passing, parallel I/O, Nested Vectored Interrupt Controller – functional description and NVIC programmers' model.

TEXTBOOKS:

1. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rd Edition, 1994.
2. The 8051 Microcontrollers and Embedded systems Using Assembly and C, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; Pearson 2-Edition, 2011.
3. The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors by Joseph You.

REFERENCE BOOKS:

1. Embedded Systems Fundamentals with Arm Cortex-M based Microcontrollers: A Practical Approach in English, by Dr. Alexander G. Dean, Published by Arm Education Media, 2017.
2. Cortex -M3 Technical Reference Manual.

Course Outcomes:

At the end of this course the student will be able to:

- Understand the architecture of microprocessor/ microcontroller and their operation.
- Demonstrate programming skills in assembly language for processors and controllers.
- Analyze various interfacing techniques and apply them for the design of processor/controller based systems.



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III Year - I Semester	L	T	P	C
	3	0	0	3
DIGITAL COMMUNICATIONS				

Course Objectives:

The student will be able to

- Understand pulse digital modulation systems such as PCM, DPCM and DM.
- Understand various digital modulation techniques and able to analyze various systems for their performance in terms of probability of error.
- Study the concepts of information theory and need for source coding.
- Study Block codes, cyclic codes and convolution codes.

UNIT I

PULSE DIGITAL MODULATION: Elements of digital communication systems, advantages of digital communication systems, Elements of PCM: Sampling, Quantization & Coding, Quantization error, Companding in PCM systems. Differential PCM systems (DPCM). Delta modulation, its drawbacks, adaptive delta modulation, comparison of PCM and DM systems, noise in PCM and DM systems.

UNIT II

DIGITAL MODULATION TECHNIQUES: Introduction, ASK, FSK, PSK, DPSK, DEPSK, QPSK, M-ary PSK, ASK, FSK, similarity of BFSK and BPSK.

UNIT III

DATA TRANSMISSION : Base band signal receiver, probability of error, the optimum filter, matched filter, probability of error using matched filter, coherent reception, non-coherent detection of FSK, calculation of error probability of ASK, BPSK, BFSK, QPSK.

UNIT IV

INFORMATION THEORY: Discrete messages, concept of amount of information and its properties. Average information, Entropy and its properties. Information rate, Mutual information and its properties.

SOURCE CODING: Introductions, Advantages, Shannon's theorem, Shannon-Fano coding, Huffman coding, efficiency calculations, channel capacity of discrete and analog Channels, capacity of a Gaussian channel, bandwidth – S/N trade off.

UNIT V

LINEAR BLOCK CODES: Introduction, Matrix description of Linear Block codes, Error detection and error correction capabilities of Linear block codes, Hamming codes, Binary cyclic codes, Algebraic structure, encoding, syndrome calculation, BCH Codes.

CONVOLUTION CODES: Introduction, encoding of convolution codes, time domain approach, transform domain approach. Graphical approach: state, tree and trellis diagram decoding using Viterbi algorithm.



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TEXT BOOKS:

1. Digital communications - Simon Haykin, John Wiley,2005
2. Digital and Analog Communication Systems - Sam Shanmugam, John Wiley,2005.

REFERENCES:

1. Principles of Communication Systems – H. Taub and D. Schilling, TMH,2003
2. Digital Communications – John Proakis, TMH, 1983. Communication Systems Analog & Digital – Singh & Sapre, TMH,2004.
3. Modern Digital and Analog Communication Systems –B.P.Lathi,Zhi Ding,Hari Mohan Gupta,Oxford University Press,4th Edition,2017

Course Outcomes:

After going through this course the student will be able to

- Analyze the performance of a Digital Communication System for probability of error and are able to design a digital communications system.
- Analyze various source coding techniques.
- Compute and analyze Block codes, cyclic codes and convolution codes.
- Design a coded communications system.



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III Year - I Semester		L	T	P	C
		3	0	0	3
ELECTRONIC MEASUREMENTS & INSTRUMENTATION					

Course Objectives:

- Learn and understand functioning of various measuring system and metrics for performance analysis.
- Acquire knowledge of principle of operation, working of different electronic instruments viz. signal generators, signal analyzers, recorders and measuring equipment.
- To Compare various measuring bridges and their balancing conditions.
- Learn and understand the use of various measuring techniques for measurement of different physical parameters using different classes of transducers.

UNIT I

Performance characteristics of instruments, Static characteristics; Accuracy, Resolution, Precision, Expected value, Error, Sensitivity. **Dynamic Characteristics;** speed of response, Fidelity, Lag and Dynamic error. Types of errors in measurements and their analysis. Design of multi-range AC , DC meters (voltmeter & ammeter) and ohmmeter (series & shunt type) using D'Arsonval movement. True rms meter.

UNIT II

Specifications and designing aspects of Signal Generators - AF sine and square wave signal generators, Function Generators, Random noise generators, Arbitrary waveform generators. Wave Analyzers, Harmonic Distortion Analyzers, Spectrum Analyzers, Digital Fourier Analyzers.

UNIT III

Oscilloscopes- general purpose CROs; block diagram , functions and implementation of various blocks, specifications, various controls and their functions , types of probes used in CROs. Measurement of frequency and phase difference using Lissajous patterns. Special purpose CROs; sampling oscilloscope, analog storage oscilloscope, digital storage oscilloscope.

UNIT IV

Bridge circuits- Wheat stone bridge, measurement of very low resistance, Measurement of inductance- Maxwell's bridge, Anderson bridge. Measurement of capacitance- Schering Bridge. Wien Bridge, Errors and precautions in using bridges.

Q-meter; principle of operation, measurement methods and sources of errors.

Counters : principle of operation -modes of operation- totalizing mode, frequency mode and time period mode- sources of errors.



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UNIT V

Transducers- active & passive transducers: Resistance, Capacitance, inductance; Strain gauges, LVDT, Piezo Electric transducers.

Measurement of physical parameters temperature, force, pressure, velocity, acceleration and displacement.

TEXTBOOKS :

1. Electronic instrumentation, second edition - H.S. Kalsi, Tata McGrawHill,2004.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrickand W.D. Cooper, PHI, 5th Edition, 2002.

REFERENCES :

1. Electronic Instrumentation & Measurements - David A. Bell, PHI, 3rd Edition,2013.
2. Electrical and Electronic Measurement and Instrumentation A.K. Sawhney. Dhanpat Rai & Co, 12thEdition,2002.

Course Outcomes:

The student will be able to

- Select the instrument to be used based on therequirements.
- Understand and analyze different signal generators andanalyzers.
- Understand the design of oscilloscopes for differentapplications.
- Design different transducers for measurement of differentparameters.



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III Year - I Semester		L	T	P	C
		3	0	0	3
INFORMATION THEORY & CODING (Professional Elective 1)					

Course objectives:

The main objectives of this course are given below

- Understand the concept of Entropy and sourcecoding
- Understand the concept of channel and its capacity
- Encoding and Decoding of Digital DataStreams
- Be Aware of Compression and DecompressionTechniques
- Learn the Concepts of MultimediaCommunication

UNIT I**INFORMATION THEORY AND SOURCE CODING**

Uncertainty, information, entropy and its properties, entropy of binary memory less source and its extension to discrete memory less source, source coding theorem, data compression, prefix coding, Huffman coding, Lempel-Ziv coding, Source with memory and itsentropy.

UNIT II**DISCRETE CHANNELS**

Binary Symmetric Channel, mutual information & its properties, Channel capacity, channel coding theorem and its application to BSC, Shannon’s theorem on channel capacity, capacity of a channel of infinite bandwidth, bandwidth - S/N trade off, practical communication systems in light of Shannon’s theorem, Fading channel, channels withmemory.

UNIT III**GROUPS, FIELDS AND LINEAR BLOCK CODES**

Galois field and its construction in $GF(2^m)$ and its basic properties, vector spaces and matrices in $GF(2)$, Linear block codes, systematic codes and its encoding circuit, syndrome and error detection, minimum distance, error detecting and correcting capabilities of block code, decoding circuit, probability of undetected error for linear block code in BSC, Hamming code and their applications.

UNIT IV**CYCLIC CODES AND BCH CODES**

Basic properties of Cyclic codes, Generator and parity check matrix of cyclic codes, encoding and decoding circuits, syndrome computation and error detection, cyclic Hamming codes, encoding and decoding of BCH codes, error location andcorrection.

UNIT V**CONVOLUTIONALCODES**

Introduction to convolution code, its construction and Viterbi algorithm for maximum likelihood decoding. Automatic repeat request strategies and their throughput efficiency considerations.



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Text Books:

1. Sklar, Digital Communication, Pearson Education Asia, 2nd Edition, 2001.
2. Shu Lin and Costello, Error Control Coding: Fundamentals and Applications, 2nd Edition, Pearson, 2004.

Reference Books:

1. Haykin Simon, Digital Communication, Wiley Publications, 2013.
2. Information theory and coding, Muralidhar Kulkarni, KS Ashiva prakash, 2015.
3. JS Chithode, Information theory and coding, Technical publishers, 1st Edition, 2014.

Course Outcomes:

At the end of this course the student will be able to

- Design an Application with Error-Control coding
- Use Compression and Decompression Techniques
- Perform source coding and channel coding



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III Year - I Semester		L	T	P	C
		3	0	0	3
DIGITAL SYSTEM DESIGN USING HDL (Professional Elective 1)					

Course objectives:

The student will be able to

- Learn and understand the architectures of Field-programmable GateArrays
- Translate a software application into hardware logic for FPGA architectures
- Design synthesizable systems based on industry-standard coding methods
- Build test benches and create data models to verify bit-true accurate designs.

UNIT-I

INTRODUCTION: Hardware Description Languages, FPGA Boards and Software Tools.

Field-Programmable Gate Arrays: Transistor as a Switch, Logic Gates from Switches, FPGA Building Blocks, Layout of the Xilinx Artix-7 XC7A35T FPGA, Input/output Blocks, Configurable Logic Blocks, Interconnect Resources, Block RAM, DSP Slices, Clock Management, The XADC Block, High-Speed Serial I/O Transceivers, Peripheral Component Interconnect Express Interface, FPGA-Based Digital System Design Philosophy, How to Think While Using FPGAs, Advantages and Disadvantages of FPGAs, Usage Areas of FPGAs

Introduction to Verilog: Verilog Fundamentals, Module Representation, Timing and Delays in Modelling, Hierarchical Module Representation, Test bench Formation in Verilog, Structure of a Verilog Test bench File, Displaying Test Results.

UNIT-II

VERILOG DATA TYPES AND OPERATORS: Data Types in Verilog, Net and Variable Data Types, Data Values, Naming a Net or Variable, Defining Constants and Parameters, Defining Vectors, Operators in Verilog, Arithmetic Operators, Concatenation and Replication Operators, Application on Data Types and Operators, FPGA Building Blocks Used in Data Types and Operators, Implementation Details of Vector Operations, Implementation Details of Arithmetic Operations.

UNIT-III

COMBINATIONAL CIRCUITS: Combinational Circuit Analysis, Logic Function Formation between Input and Output, Boolean Algebra, Gate-Level Minimization, Combinational Circuit Implementation, Truth Table-Based Implementation, Combinational Circuit Design.

COMBINATIONAL CIRCUIT BLOCKS: Adders in Verilog, Comparators in Verilog, Decoders in Verilog, Encoders in Verilog, Multiplexers in Verilog, Parity Generators and Checkers in Verilog, Applications on Combinational Circuits, Implementing the Home Alarm System, Implementing the Digital Safe System, Implementing the Car Park Occupied Slot Counting System, FPGA Building Blocks Used in Combinational Circuits.

DATA STORAGE ELEMENTS: Latches in Verilog, Flip-Flops in Verilog, Register, Memory, Read-Only Memory, ROM in Verilog, ROM Formation Using IP Blocks, Random Access



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Memory, Application on Data Storage Elements, FPGA Building Blocks Used in Data Storage Elements.

UNIT-IV

SEQUENTIAL CIRCUITS: Sequential Circuit Analysis, State Table, State Diagram, State Representation in Verilog, Timing in Sequential Circuits, Synchronous Operation, Asynchronous Operation, Shift Register as a Sequential Circuit, Shift Registers in Verilog, Multiplication and Division Using Shift Registers, Counter as a Sequential Circuit, Synchronous Counter, Asynchronous Counter, Counters in Verilog, Frequency Division Using Counters, Sequential Circuit Design, Applications on Sequential Circuits.

UNIT-V

DIGITAL INTERFACING: Universal Asynchronous Receiver/Transmitter(UART) in Verilog, UART Applications, Serial Peripheral Interface (SPI) in Verilog, , SPI Application, Inter-Integrated Circuit (I²C) in Verilog, , I2C Application, Video Graphics Array (VGA) in Verilog, VGA Application, Universal Serial Bus (USB) Receiving Module in Verilog, USB Keyboard Application, Ethernet, FPGA Building Blocks Used in Digital Interfacing.

ADVANCED APPLICATIONS: Vending Machine, Digital Clock, Moving Wave via LEDs, Translator, Air Freshener Dispenser, Obstacle-Avoiding Tank, Intelligent Washing Machine, Non-Touch Paper Towel Dispenser, Car Parking Sensor System. Digital Table Tennis Game.

TEXT BOOKS:

1. CemUnsalan, BoraTar“DigitalSystemDesignwithFPGAImplementationUsing Verilog and VHDL” McGraw-Hill Education,2017
2. Design through Verilog HDL – T.R. Padmanabhan and B. Bala Tripura Sundari, WSE, IEEE Press,2004.

REFERENCES:

1. Advanced Digital Design with Verilog HDL – Michael D. Ciletti, PHI,2005.
2. Fundamentals of Logic Design with Verilog – Stephen. Brown andZvonkoVranesic, TMH,2005.
3. A Verilog Primer – J. Bhasker, BSP,2003.

Course Outcomes:

At the end of this course the student will be able to

- Understand the architecture of FPGAs, tools used in modelling of digitaldesign
- Analyze and design basic digital circuits with combinatorial and sequential logic circuits using VerilogHDL.
- Model complex digital systems at several levels ofabstractions.
- Design real time applications such as vending machine and washing machinesetc.



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III Year - I Semester		L	T	P	C
		3	0	0	3
DATASTRUCTURES and ALGORITHMS (Professional Elective 1)					

Course objectives:

- Explain the systematic methods of efficiently organizing and accessing data in data structures and algorithms.
- Identify the properties and structural patterns in data structures.
- Apply abstract data types to the design of data structures.
- Analyze algorithms using a mathematical notation and experimental studies.
- Perform comparative analysis of the typical data structures and algorithms.
- Design and analyze recursive algorithms in data structures

UNIT – I:

Data Structures Basics: Structure and Problem Solving, Data structures, Datastructure Operations, Algorithm: complexity, Time- space trade-off.

Linked List: Introduction, Linked lists, Representation of linked lists in Memory, traversing a linked list, Searching a linked list, Memory allocation and Garbage collection, insertion into linked list, Deletion from a linked list, Types of linked list.

UNIT – II:

Stack and Queue: Introduction, Array Representation of Stack, Linked List Representation of stack, Application of stack, Queue, Array Representation of Queue, Linked List Representation of Queue.

Trees: Definitions and Concepts, Operations on Binary Trees, Representation of binary tree, Conversion of General Trees to Binary Trees, Sequential and Other Representations of Trees, Tree Traversal.

UNIT – III:

Graphs: Matrix Representation of Graphs, List Structures, Other Representations of Graphs, Breadth First Search, Depth First Search, Spanning Trees. Directed Graphs Types of Directed Graphs; Binary Relation as a Digraph; Euler's Digraphs; Matrix Representation of Digraphs.

Applications of Graphs: Topological Sorting, Shortest-Path Algorithms – Weighted Shortest Paths – Dijkstra's Algorithm, Minimum spanning tree- Prim's Algorithm, Introduction to NP-Completeness.

UNIT – IV:

Searching and Sorting Techniques: Sorting Techniques – Bubblesort, Merge sort, Selection sort, Heap sort, Insertion Sort, Searching Techniques – Sequential Searching, Binary Searching, Search Trees.

Elementary Algorithms: Notation for Expressing Algorithms; Role and Notation for Comments; Example of an Algorithm; Problems and Instances; Characteristics of an Algorithm;



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Building Blocks of Algorithms; Procedure and Recursion – Procedure, Recursion; Outline of Algorithms; Specification Methods for Algorithms.

UNIT – V:

Mathematical Functions and Notations: Functions and Notations; Modular Arithmetic / Mod Function; Mathematical Expectation in Average Case Analysis; Efficiency of an Algorithm; Well Known Asymptotic Functions and Notations; Analysis of Algorithms – Simple Examples; Well Known Sorting Algorithms – Insertion sort, Bubble sort, Selection sort, Shell sort, Heap sort.

Divide and Conquer: Divide and Conquer Strategy; Binary Search; Max. And Min.; Merge sort; Quick sort. Greedy Method: Greedy Method Strategy; Optimistic Storage on Tapes; Knapsack Problem; Job Sequencing with Deadlines; Optimal Merge Pattern; Single Source ShortlistPaths.

Dynamic Programming: Dynamic Programming Strategy; Multistage Graphs; All Pair Shortest Paths; Travelling Salesman Problems. Backtracking Strategy, 8-Queens Problem, Sum of Subsets, Knapsack Problem.

TEXTBOOKS:

1. Data structures and Algorithm Analysis in C++, M. A. Weiss, 3rd Edition, Addison-Wesley, 2005.
2. Data structures in C++, Malik D.S, 2nd Edition, Cengage Learning, 2009.
3. Data structures, Richard F. Gilberg and Behrouz A. Forouzan, 2nd Edition, Cengage Learning, 2007.

REFERENCE BOOKS:

1. Data Structures and Algorithms: Concepts – Techniques and Applications, G. A. V. Pai, 1st Edition, McGraw Hill Education, 2017.
2. Classic Data Structures, Debasis Samanta, 2nd Edition, PHI, 2009.
3. Data structures, Seymour Lipschutz, 1st Edition, McGraw Hill Education, 2014.

Course Outcomes:

At the end of the course, students will be able to

- Demonstrate analytical comprehension of concepts such as abstract datatypes
- Analyze various generic programming techniques,
- Compare various sorting algorithms and perform their efficiency analysis.
- Demonstrate the ability to analyze, design, apply and use data structures and algorithms to solve engineering problems and evaluate their solutions.
- Demonstrate the ability of using generic principles for data representation & manipulation with a view for efficiency, maintainability, and code-reuse.



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III Year - I Semester		L	T	P	C
		3	0	0	3
SOFT COMPUTING TECHNIQUES AND PYTHON PROGRAMMING (Professional Elective 1)					

Course Objectives:

The objectives of this course include

- Teach an example of scripting and interpretative language and compare it with classical compiled programming languages
- Introduce the student to Python programming fundamentals
- Expose students to application development and prototyping using Python
- Learn to apply fundamental problem solving technique
- Introduce the student to soft computing and genetic algorithms with relevant applications

UNIT-I:

Introduction: History of Python, Need of Python Programming, how a program works, Variables, Operators in python, type conversions, expressions, if, if-elif-else, for, while, break, continue, pass.

UNIT – II:

Types, Data structures and functions: Types - Integers, Strings, Booleans; Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions. Defining Functions, Calling Functions, Passing Arguments, types of arguments, Anonymous Functions, Scope of the Variables in a Function - Global and Local Variables, introduction to modules, creating modules, name spacing.

UNIT –III: Design with classes and GUI - Classes, 'self-variable', Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding, polymorphism, working with instances. GUI Programming, using the tkinter module, display text with label widgets, widgets with frames, button widgets and info dialog boxes, getting input with entry widget, check buttons, radio buttons, Turtle Graphics.

UNIT – IV: Introduction to soft computing and fuzzy systems: Evolutionary computing, soft computing vs hard computing, soft computing methods, recent trends in soft computing, characteristics of soft computing, applications of soft computing, fuzzy sets, fuzzy relations, fuzzy logic, fuzzy rule-based systems

UNIT – V: Genetic Algorithms: Basic concepts, basic operators for genetic algorithms, crossover and mutation properties, genetic algorithm cycle, fitness function. Rough sets, rule induction and discernibility matrix, integration of soft computing techniques.



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TEXT BOOKS :

1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage learning.
2. Think Python First Edition, by Allen B. Downey, O’rielly publishing,2001.
3. Python Programming, vamsi kurama, Pearson,2017.
4. Soft Computing – Advances and applications – Jan 2015 by B.K. Tripathy and J.Anuradha CengageLearning

REFERENCE BOOKS:

1. Introduction to Computation and programming using python. John v. guttag, the MIT press, 2nd Edition,2016.
2. James Payne, beginning python using python 2.6 and python 3, Wrox publishing,2010.

Course Outcomes:

- Understand and comprehend the basics of pythonprogramming.
- Demonstrate the principles of structured programming and be able to describe,design, implement, and test structured programs using currently acceptedmethodology.
- Explain the use of the built-in data structures list, sets, tuples anddictionary.
- Make use of functions and itsapplications.
- Identify real-world applications using oops, files and exceptionhandling provided by python.
- Formulate and implement a program to solve a real-world problem using GUI and Turtle graphics.
- Understand soft computing applications



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III Year - I Semester		L	T	P	C
		3	0	0	3
SIMULATION & MATHEMATICAL MODELING (Professional Elective 1)					

OBJECTIVE:

To introduce various system modelling and simulation techniques and highlight their applications in different areas. It includes modelling, design, simulation, planning, verification and validation.

UNIT – I:**Introduction to Simulation**

When simulation is the appropriate tool and when it is not appropriate; Advantages and disadvantages of Simulation; Areas of application; Systems and system environment; Components of a system; Discrete and continuous systems; Model of a system; Types of Models; Discrete-Event System Simulation; Steps in a Simulation Study. The basics of Spreadsheet simulation, Simulation example: Simulation of queuing systems in a spreadsheet. General Principles, Simulation software: Concepts in Discrete-Event Simulation: The Event-Scheduling / Time-Advance Algorithm, World Views, Manual simulation Using Event Scheduling; List processing.

UNIT –II:**Mathematical Models**

Statistical Models in simulation – Concepts, Discrete Distribution, Continuous Distribution, Poisson Process, Empirical Distributions, Queuing Models – Characteristics, Notation, Queuing Systems, Markovian Models, Generation of Pseudo Random numbers, Properties of random numbers, Techniques for generating random numbers, Testing random number generators, Generating Random-Variates, Inverse Transform technique, Acceptance- Rejection technique, Composition & Convolution Method

UNIT – III:**Analysis of Simulation Data**

Input modelling: Data Collection; Identifying the distribution with data, Parameter estimation, Goodness of Fit Tests, fitting a non-stationary Poisson process, Selecting input models without data, Multivariate and Time-Series input models.

Estimation of Absolute Performance: Types of simulations with respect to output analysis; Stochastic nature of output data; Absolute measures of performance and their estimation; Output analysis for terminating simulations; Output analysis for steady-state simulations.

UNIT – IV:**Verification, Calibration, and Validation**

Optimization: Model building, verification and validation; Verification of simulation models; Calibration and validation of models, Optimization via Simulation

Simulation of computer systems and case studies



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Simulation tools, Model input, high level computer system simulation, comparison of systems via simulation, simulation programming techniques, development of simulation models.

UNIT – V:

Case Studies

City traffic simulation, Indoor air quality simulation of a building, machine health simulation (DC motor health)

TEXTBOOKS:

1. Discrete Event System Simulation, Jerry Banks and John S. Carson II, 5th Edition, Pearson, 2010.
2. Simulation Modelling and Analysis, Averill M. Law, 4th Edition, McGraw Hill, 2007.
3. Introduction to probability models, Sheldon M. Ross, 7th Edition, Academic Press, 2000.

REFERENCE BOOKS:

1. Simulation, Sheldon M. Ross, 5th Edition, Elsevier, 2012.
2. System Modelling and Simulation – An Introduction, Frank L. Severance, Wiley, 2001.
3. System Simulation, Geoffrey and Gordon, 2nd Edition, PHI, 2002.
4. Handbook of simulation: Principles, Methodology, Advances, Applications and Practice, Jerry Banks, 1st Edition, Wiley, 1998.

Course Outcomes:

At the end of the course, students will be able to

- Solve real world problems which cannot be solved strictly by mathematical approaches.
- Understand the principles within mathematic modelling of material science.
- Demonstrate the ability describe the mathematical components in mechanical and thermal analyses.
- be able to describe the conditions in numerical code for solving stress loading problems.



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III Year - I Semester		L	T	P	C
		0	0	3	1.5
LINEAR INTEGRATED CIRCUITS and APPLICATIONS LAB					

List of Experiments: (Minimum Twelve Experiments to be conducted)

1. Study of OP AMPs – IC 741, IC 555, IC 565, IC 566, IC 1496 – functioning, parameters and Specifications.
2. OP AMP Applications – Adder, Subtractor, Comparator Circuits.
3. A. Integrator and Differentiator Circuits.
4. B. Waveform Generator using single OP-AMP with variable duty cycle
5. Active Filter Applications – LPF, HPF (first order)
6. Active Filter Applications – BPF, Band Reject (Wideband) and Notch Filters.
7. Oscillator Circuits – Phase Shift and Wien Bridge Oscillators using single OP-AMP
8. Function Generator using OPAMPs.
9. IC 555 Timer – Monostable Operation Circuit, Astable Operation Circuit
10. Design Schmitt Trigger Circuits – using Single OP-AMP with Reference voltage.
11. PLL Operation and Estimation of Capture and Lock range.
12. IC 566 – VCO Applications.
13. Design of Dual Power Supply using 78XX and 79XX (use full wave Bridge Rectifier with shunt capacitance filters).

Equipment required for Laboratories:

1. Dual TRPS
2. CRO
3. Function Generators 1MHz
4. Multi Meters (Digital, FET input Voltmeters)
5. Analog IC Trainer Kits
7. Bread Boards
8. Components: - IC741, IC555, IC565, IC1496, IC723, 7805, 7809, 7912, 8038 and other

Essential components:

1. Analog IC Tester.



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Add on Experiments:

1. Design a 4-bit R-2R Ladder network with OP-AMP Buffer and Measure the output waveform for various input combinations.
2. Construct Waveform Generator using 8038 for a fixed frequency and trace the output waveform.
3. Design and Construct $\pm 12V$ DC Power Supply using Three terminal Voltage Regulators 7812 and 7912.



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III Year - I Semester		L	T	P	C
		0	0	3	1.5
DIGITAL COMMUNICATIONS LAB					

List of Experiments: Minimum Twelve Experiments to be conducted:

1. Time divisionmultiplexing.
2. Pulse codemodulation.
3. Differential pulse codemodulation.
4. Deltamodulation.
5. Frequency shiftkeying.
6. Phase shiftkeying.
7. Differential phase shiftkeying.
8. Companding
9. Source Encoder andDecoder
10. Linear Block Code-Encoder andDecoder
11. Binary Cyclic Code - Encoder andDecoder
12. Convolution Code - Encoder andDecoder
13. BCH Codes

Equipment required for Laboratories:

1. RPS - 0 – 30 V
2. CRO - 0 – 20 MHz.
3. Function Generators - 0 – 1 MHz
4. RF Generators - 0 – 1000 M Hz./0 – 100 MHz.
5. Rated Voltmeters andAmmeters
6. Lab Experimental kits for DigitalCommunication
7. Components
8. Breadboards and Multimeters
9. Spectrum Analyzer



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III Year - I Semester		L	T	P	C
		0	0	3	1.5
MICROPROCESSOR and MICROCONTROLLERS LAB					

List of Experiments:

PART- A: (Minimum of 5 Experiments has to be performed)

8086 Assembly Language Programming and Interfacing

1. Programs for 16 -bit arithmetic operations (using Various Addressing Modes).
 - a. Addition of n-BCD numbers.
 - b. Multiplication and Division operations.
2. Program for sorting an array.
3. Program for Factorial of given numbers.
4. Interfacing ADC to 8086
5. Interfacing DAC to 8086.
6. Interfacing stepper motor to 8086.

PART-B: (Minimum of 5 Experiments has to be performed)

8051 Assembly Language Programming and Interfacing

1. Finding number of 1's and number of 0's in a given 8-bit number
2. Average of n numbers.
3. Program and verify Timer/ Counter in 8051.
4. Interfacing Traffic Light Controller to 8051.
5. UART operation in 8051
6. Interfacing LCD to 8051.

PART-C (Minimum of 2 Experiments has to be performed)

Conduct the following experiments using ARM CORTEX M3 PROCESSOR USING KEIL MDK ARM

1. Write an assembly program to multiply of 2 16-bit binary numbers.
2. Write an assembly program to find the sum of first 10 integers numbers.
3. Write a program to toggle LED every second using timer interrupt.

Equipment Required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. 8086 Microprocessor kits
4. 8051 microcontroller kits
5. ADC module
6. DAC module
7. Stepper motor module



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8. Keyboardmodule
9. LED, 7-SegmentUnits
10. DigitalMultimeters
11. ROM/RAM Interfacemodule
12. Bread Boardetc.
13. ARM CORTEX M3
14. KEIL MDKARM



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III Year - I Semester	L	T	P	C
	0	0	3	1.5
MINI PROJECT WITH HARDWARE DEVELOPMENT				

Mini Project is introduced during V semester. The student may execute the mini project during summer vacation for a period of 6 weeks i.e. between IV and V Semesters. The student shall submit a diary and a technical report for evaluation. This shall be evaluated in the V semester for 50 marks by a committee consisting of external examiner, Head of the Department along with supervisor and two senior faculty members of the Department. Mini Project work may involve carrying out a detailed feasibility study, literature survey along with the implementation results and preparing a work plan for major project. A student shall acquire 1.5 credits assigned, when he/she secures 40% or more marks for the total of 50 marks. In case, if a student fails, he/she shall reappear as and when the VII semester supplementary examinations are conducted.



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III Year - I Semester	L	T	P	C
	3	0	0	0
ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE				

Course Objectives:

To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system

- The course aim of the importing basic principle of third process reasoning and inference sustainability is at the course of Indian traditional knowledgesystem
- To understand the legal framework and traditional knowledge and biological diversity act 2002 and geographical indication act2003
- The courses focus on traditional knowledge and intellectual property mechanism of traditional knowledge andprotection
- To know the student traditional knowledge in differentsector

Course Outcomes:

After completion of the course, students will be able to:

- Understand the concept of Traditional knowledge and itsimportance
- Know the need and importance of protecting traditionalknowledge
- Know the various enactments related to the protection of traditionalknowledge
- Understand the concepts of Intellectual property to protect the traditionalknowledge

UNIT I

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge

Learning Outcomes:

At the end of the unit, the student will able to:

- Understand the traditionalknowledge.
- Contrast and compare characteristics importance kinds of traditionalknowledge.
- Analyze physical and social contexts of traditionalknowledge.
- Evaluate social change on traditionalknowledge.

UNIT II

Protection of traditional knowledge: the need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

Learning Outcomes:

At the end of the unit, the student will able to:

- Know the need of protecting traditionalknowledge.
- Apply significance of tkprotection.



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- Analyze the value of tk in globaleconomy.
- Evaluate role ofgovernment

UNIT III

Legal framework and TK: A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmers Rights Act, 2001 (PPVFR Act);B:The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indications act 2003.

Learning Outcomes:

At the end of the unit the student will able to:

- Understand legal framework ofTK.
- Contrast and compare the ST and other traditional forestdwellers
- Analyze plant variantprotections
- Evaluate farmers rightact

UNIT IV

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

Learning Outcomes:

At the end of the unit, the student will ableto:

- Understand TK andIPR
- Apply systems of TKprotection.
- Analyze legal concepts for the protection ofTK.
- Evaluate strategies to increase the protection ofTK.

UNIT V

Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

Learning Outcomes:

At the end of the unit, the student will able to:

- Know TK in differentsectors.
- Apply TK inengineering.
- Analyze TK in varioussectors.
- Evaluate food security and protection of TK in thecountry.



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Reference Books:

- 1) Traditional Knowledge System in India, by Amit Jha, 2009.
- 2) Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, PratibhaPrakashan 2012.
- 3) Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002
- 4) "Knowledge Traditions and Practices of India" Kapil Kapoor, Michel Danino

e-Resources:

- 1) <https://www.youtube.com/watch?v=LZP1StpYEPM>
- 2) <http://nptel.ac.in/courses/121106003/>



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	3	0	0	3

WIRED and WIRELESS TRANSMISSION DEVICES

Course objectives:

The student will be able to

- understand the applications of the electromagnetic waves in freespace.
- introduce the working principles of various types of antennas
- discuss the major applications of antennas with an emphasis on how antennas are employed to meet electronic system requirements.
- understand the concepts of radio wave propagation in the atmosphere.

UNIT I

MICROWAVE TRANSMISSION LINES: Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides – TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations; Power Transmission and Power Losses in Rectangular Guide, Impossibility of TEM mode. Related Problems, Excitation techniques-waveguides

MICROSTRIP LINES– Introduction, Z_0 Relations, Effective Dielectric Constant, Losses, Q factor

UNIT II

ANTENNA FUNDAMENTALS: Introduction, Radiation Mechanism – single wire, 2 wire, dipoles, Current Distribution on a thin wire antenna. Antenna Parameters - Radiation Patterns, Patterns in Principal Planes, Main Lobe and Side Lobes, Beam widths, Polarization, Radiation Intensity, Directivity, Gain Antenna Apertures, Aperture Efficiency, Effective Height, illustrated Problems.

UNIT III

THIN LINEAR WIRE ANTENNAS: Retarded Potentials, Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Evaluation of Field Components, Power Radiated, Radiation Resistance, Beam widths, Directivity, Effective Area and Effective Height, Antenna Theorems – Applicability and Proofs for equivalence of directional characteristics, Loop Antennas: Small Loops - Field Components, Concept of short magnetic dipole, D and R_r relations for small loops.

ANTENNA ARRAYS: Principle of Pattern Multiplication, N element Uniform Linear Arrays – Broadside, End-fire Arrays, Binomial Arrays, Arrays with Parasitic Elements. Yagi-Uda Arrays, Folded Dipoles and their characteristics.



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UNIT IV

NON-RESONANT RADIATORS: Introduction, Traveling wave radiators, Long wire antennas, Rectangular Patch Antennas –Geometry and Parameters, Impact of different parameters on characteristics. Helical Antennas, Geometry, basic properties

VHF, UHF AND MICROWAVE ANTENNAS: Reflector Antennas: Corner Reflectors. Parabolic Reflectors – Geometry, characteristics, types of feeds, F/D Ratio, Spill Over, Back Lobes, Aperture Blocking, Cassegrain Feeds.

Horn Antennas – Types, Optimum Horns, Lens Antennas – Geometry, Features, Dielectric Lenses and Zoning, Applications.

UNIT V

WAVE PROPAGATION: Concepts of Propagation – frequency ranges and types of propagations. Ground Wave Propagation–Characteristics, Fundamental Equation for Free-Space Propagation, Basic Transmission Loss Calculations, Space Wave Propagation–Mechanism, LOS and Radio Horizon, Tropospheric Wave Propagation – Radius of Curvature of path, Effective Earth's Radius, Effect of Earth's Curvature, Field Strength Calculations.

ANTENNA MEASUREMENTS – Patterns, Set Up, Distance Criterion, Directivity, VSWR, Impedance and Gain Measurements (Comparison, Absolute and 3-Antenna Methods)

TEXT BOOKS

1. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition,2000.
2. Antennas and wave propagation- Sisir K Das, Annapurna Das, TMH,2013.

REFERENCES

1. Antennas – John D. Kraus, McGraw-Hill, 2nd Edition,1988.
2. Transmission and Propagation – E.V.D. Glazier and H.R.L. Lamont, The Services Text Book of Radio, vol. 5, Standard Publishers Distributors,Delhi,2009.
3. Antennas and wave propagation by Prof G S N Raju, Pearsion Publications, First impression,2016

Course Outcomes:

After going through this course the student will be able to

- Identify basic antennaparameters.
- Design and analyze wire antennas, loop antennas, reflector antennas, lens antennas, horn antennas and micro stripantennas
- Quantify the fields radiated by various types ofantennas
- Design and analyze antennaarrays
- Analyze antenna measurements to assess antenna'sperformance
- Identify the characteristics of radio wavepropagation



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		3	0	0	3
VLSI DESIGN					

OBJECTIVES:

The main objectives of this course are:

- To learn the MOS Process Technology
- To understand the operation of MOS devices
- Understand and learn the characteristics of CMOS circuit construction.
- Describe the general steps required for processing of CMOS integrated circuits.
- To impart in-depth knowledge about analog and digital CMOS circuits.

UNIT-I:

INTRODUCTION AND BASIC ELECTRICAL PROPERTIES OF MOS CIRCUITS: VLSI Design Flow, Introduction to IC technology, Fabrication process: nMOS, pMOS and CMOS. I_{ds} versus V_{ds} Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. nMOS Inverter, Pull-up to Pull-down Ratio for nMOS inverter driven by another nMOS inverter, and through one or more pass transistors. Alternative forms of pull-up, The CMOS Inverter, Latch-up in CMOS circuits, Bi-CMOS Inverter, Comparison between CMOS and BiCMOS technology, MOS Layers, Stick Diagrams, Design Rules and Layout, Layout Diagrams for MOS circuits

UNIT-II:

BASIC CIRCUIT CONCEPTS: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, some area Capacitance Calculations, The Delay Unit, Inverter Delays, driving large capacitive loads, Propagation Delays, Wiring Capacitances, Choice of layers.

SCALING OF MOS CIRCUITS: Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling, Limits due to sub threshold currents, Limits on logic levels and supply voltage due to noise and current density. Switch logic, Gate logic.

UNIT-III:

BASIC BUILDING BLOCKS OF ANALOG IC DESIGN: Regions of operation of MOSFET, Modelling of transistor, body bias effect, biasing styles, single stage amplifier with resistive load, single stage amplifier with diode connected load, Common Source amplifier, Common Drain amplifier, Common Gate amplifier, current sources and sinks.

UNIT-IV:

CMOS COMBINATIONAL AND SEQUENTIAL LOGIC CIRCUIT DESIGN:

Static CMOS Design: Complementary CMOS, Rationed Logic, Pass-Transistor Logic.

Dynamic CMOS Design: Dynamic Logic-Basic Principles, Speed and Power Dissipation of Dynamic Logic, Issues in Dynamic Design, Cascading Dynamic Gates, Choosing a Logic Style,



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Gate Design in the Ultra Deep-Submicron Era, Latch Versus Register, Latch based design, timing decimation, positive feedback, instability, Metastability, multiplexer based latches, Master-Slave Based Edge Triggered Register, clock to q delay, setup time, hold time, reduced clock load master slave registers, Clocked CMOS register. Cross coupled NAND and NOR, SR Master Slave register, Storage mechanism, pipelining

UNIT-V:

FPGA DESIGN: FPGA design flow, Basic FPGA architecture, FPGA Technologies, Introduction to FPGA Families.

INTRODUCTION TO ADVANCED TECHNOLOGIES: Giga-scale dilemma, Short channel effects, High-k, Metal Gate Technology, FinFET, TFET.

TEXTBOOKS:

1. Essentials of VLSI Circuits and Systems - Kamran Eshraghian, Douglas and A. Pucknell And Sholeh Eshraghian, Prentice-Hall of India Private Limited, 2005 Edition.
2. Design of Analog CMOS Integrated Circuits by Behzad Razavi, McGraw Hill, 2003
3. Digital Integrated Circuits, Jan M. Rabaey, Anantha Chandrakasan and Borivoje Nikolic, 2nd edition, 2016.

REFERENCES:

1. “Introduction to VLSI Circuits and Systems”, John P. Uyemura, John Wiley & Sons, reprint 2009.
2. Integrated Nanoelectronics: Nanoscale CMOS, Post-CMOS and Allied Nanotechnologies Vinod Kumar Khanna, Springer India, 1st edition, 2016.
3. FinFETs and other multi-gate transistors, Colinge JP, Editor New York, Springer, 2008.

OUTCOMES:

At the end of this course the student will be able to:

- Demonstrate a clear understanding of CMOS fabrication flow and technology scaling.
- Apply the design Rules and draw layout of a given logic circuit.
- Design MOSFET based logic circuit.
- Design basic building blocks in Analog IC design.
- Analyze the behaviour of amplifier circuits with various loads.
- Design various CMOS logic circuits for design of Combinational logic circuits.
- Design amplifier circuits using MOS transistors.
- Design MOSFET based logic circuits using various logic styles like static and dynamic CMOS.
- Analyze the behaviour of static and dynamic logic circuits.



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		3	0	0	3
DIGITAL SIGNAL PROCESSING					

Course Objectives:

The student will be able to

- Analyze the discrete-time signals and systems in time and frequency domains.
- Know the importance of FFT algorithm for computation of Discrete Fourier Transform
- Understand the various implementations of digital filter structures
- Learn the FIR and IIR Filter design procedures
- Learn the concepts of DSP Processors

UNIT I INTRODUCTION: Introduction to Digital Signal Processing: Discrete-time signals & sequences, Classification of discrete-time systems, stability and causality of LTI systems, Response of LTI systems to arbitrary inputs. Solution of linear constant coefficient difference equations. Discrete-time Fourier Transform (DTFT), Frequency domain representation of discrete-time signals and systems. Review of Z-transforms, solution of difference equations using Z-transforms, System function.

UNIT II DISCRETE FOURIER SERIES & FOURIER TRANSFORMS: Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear filtering methods based on DFT, Fast Fourier transforms (FFT)-Radix-2 decimation-in-time and decimation-in-frequency FFT Algorithms, Inverse FFT, Circular convolution and linear convolution using DFT.

UNIT III DESIGN OF IIR DIGITAL FILTERS & REALIZATIONS: Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples, Analog and Digital frequency transformations. Basic structures of IIR systems, Transposed forms.

UNIT IV DESIGN OF FIR DIGITAL FILTERS & REALIZATIONS:

Characteristics of FIR Digital Filters, Frequency response. Design of FIR Digital Filters using Window technique and Frequency Sampling technique, Comparison of IIR & FIR filters. Basic structures of FIR systems.

UNIT V INTRODUCTION TO DSP PROCESSORS: Introduction to programmable DSPs: Multiplier and Multiplier Accumulator, Modified bus structures and memory access schemes in P-DSPs, Multiple Access Memory, Multiported memory, VLIW architecture, Pipelining, Special addressing modes, On-Chip Peripherals.

Architecture of ARM processors: Technical details of ARM Processors, Introduction to



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Cortex-M3 and cortex M4 processors - Processor type, processor architecture, instruction set, block diagram, memory systems.

TEXT BOOKS:

1. Digital Signal Processing, Principles, Algorithms and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education/PHI,2007.
2. Discrete Time Signal Processing, A. V. Oppenheim and R. W. Schaffer,PHI,2010.
3. Digital Signal Processors, Architecture, Programming and Applications, B.Venkataramani, M. Bhaskar, TMH,2002.
4. Digital Signal Processing Using the ARM Cortex M4, Donald S.Reay,2015.

REFERENCE BOOKS:

- 1 Digital Signal Processing: MH Hayes, Schaum's Outlines, TMH,2007.
- 2 Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling,Sandra L. Harris, Thomson, 2007.
- 3 Digital Signal Processing, Alan V. Oppenheim, Ronald W. Schafer, PHI Ed.,2006
- 4 Digital Signal Processing, Tarun Kumar Rawat by OXFORD Publishers

Course Outcomes:

After going through this course the student will be able to

- Formulate engineering problems in terms of DSP operations
- Analyze digital signals and systems
- Analyze discrete time signals in frequency domain
- Design digital filters and implement with different structures
- Understand the key architectural



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III Year - II Semester		L	T	P	C
		3	0	0	3
CELLULAR & MOBILE COMMUNICATION (Professional Elective 2)					

Course Objectives:

The student will be introduced to:

- Understand the basic cellular concepts like frequency reuse, cell splitting, cell sectoring etc and various cellular systems.
- Understand the different types of interferences influencing cellular and mobile communication.
- Understand the frequency management, channel assignment and various propagation effects in cellular environment.
- Understand the different types of antennas used at cell site and mobile.
- Understand the concepts of handoff and types of handoffs.
- Understand the architectures of GSM and 3G cellular systems.

UNIT I

CELLULAR MOBILE RADIO SYSTEMS: Introduction to Cellular Mobile System, uniqueness of mobile radio environment, operation of cellular systems, consideration of the components of Cellular system, Hexagonal shaped cells, Analog and Digital Cellular systems.

CELLULAR CONCEPTS: Evolution of Cellular systems, Concept of frequency reuse, frequency reuse ratio, Number of channels in a cellular system, Cellular traffic: trunking and blocking, Grade of Service; Cellular structures: macro, micro, pico and femto cells; Cell splitting, Cell sectoring.

UNIT II

INTERFERENCE: Types of interferences, Introduction to Co-Channel Interference, real time Co-Channel interference, Co-Channel measurement, Co-channel Interference Reduction Factor, desired C/I from a normal case in a omni-directional Antenna system, design of Antenna system, antenna parameters and their effects, diversity receiver, non-cochannel interference-different types.

UNIT III

FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT: Numbering and grouping, setup access and paging channels, channel assignments to cell sites and mobile units: fixed channel and non-fixed channel assignment, channel sharing and borrowing, overlaid cells.

CELL COVERAGE FOR SIGNAL AND TRAFFIC: Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long distance propagation, antenna height gain, form of a point to point model.



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UNIT IV

HANDOFF STRATEGIES:

Concept of Handoff, types of handoff, handoff initiation, delaying handoff, forced handoff, mobile assigned handoff, intersystem handoff, soft and hard hand offs, vehicle locating methods, dropped call rates and their evaluation.

UNIT V

DIGITAL CELLULAR NETWORKS: GSM architecture, GSM channels, multiple access schemes; TDMA, CDMA, OFDMA. 3G and 4G Wireless Standards GSM, GPRS, WCDMA, LTE, Wi-MAX, Introduction to 5G standards.

TEXT BOOKS:

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2nd Edn., 2006.
2. Principles of Mobile Communications – Gordon L. Stuber, Springer International 2nd Edition, 2007.
3. Advanced Wireless Communications-4G By. Savo G Glisic, John Wiley & Sons Publication 2nd Edition

REFERENCES:

1. Wireless Communications – Theodore. S. Rapport, Pearson education, 2nd Edn., 2002.
2. Wireless Communication and Networking – Jon W. Mark and Weihua Zhqung, PHI, 2005.
3. Fundamentals of Wireless Communication By. David Tse and Pramod Viswanath, Cambridge University Press

Course Outcomes:

At the end of this course the student can able to:

- Identify the limitations of conventional mobile telephone systems; understand the concepts of cellular systems.
- Understand the frequency management, channel assignment strategies and antennas in cellular systems.
- Understand the concepts of handoff and architectures of various cellular systems.



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III Year - II Semester		L	T	P	C
		3	0	0	3
DIGITAL IC DESIGN (Professional Elective-2)					

Course objectives:

The main objectives of this course are:

- The student will be able to understand the MOS Design.
- In this course, students can study Combinational MOS Logic Circuits and Sequential MOS Logic Circuits.
- Another main object of this course is to motivate the graduate students to design and to develop the Digital Integrated Circuits for different Applications.
- The concepts of Semiconductor Memories, Flash Memory, RAM Array organization

UNIT-I

MOS DESIGN: Pseudo NMOS Logic – Inverter, Inverter threshold voltage, output high voltage, Output Low voltage, gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

UNIT-II

COMBINATIONAL MOS LOGIC CIRCUITS: MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates, AOI and OIA gates, CMOS full adder, CMOS transmission gates, Designing with Transmission gates.

UNIT-III

SEQUENTIAL MOS LOGIC CIRCUITS: Behaviour of bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.

DYNAMIC LOGIC CIRCUITS: Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits.

UNIT-IV

INTERCONNECT: Capacitive Parasitics, Resistive Parasitics, Inductive Parasitics, Advanced Interconnect Techniques.

UNIT-V

SEMICONDUCTOR MEMORIES: Memory Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory- NOR flash and NAND flash.



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TEXTBOOKS:

1. Digital Integrated Circuits – A Design Perspective, Jan M. Rabaey, AnanthaChandrakasan, Borivoje Nikolic, 2ndEd., PHI, 2016.
2. Digital Integrated Circuit Design – Ken Martin, Oxford University Press, 2011.

REFERENCES:

1. CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 3rd Ed., 2011.
2. CMOS VLSI Design – Neil H.E Weste, David harris, Ayan Banerjee 3rd Edition, Pearson, 2006.

Course Outcomes:

At the end of this course the student will be able to:

- Understand the concepts of MOS Design.
- Design and analysis of Combinational and Sequential MOS Circuits.
- Extend the Digital IC Design to Different Applications.
- Understand the Concepts of Semiconductor Memories, Flash Memory, RAM array organization



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		3	0	0	3
BUSINESS INTELLIGENCE & ANALYTICS (Professional Elective 2)					

OBJECTIVE:

To make students to extract insights from large volumes of data in various forms, by employing statistical mathematics techniques for drawing conclusions about that information

UNIT – I

Essentials of Data analysis - Data Collection, Data Cleansing, Data Exploration, Statistical Analysis, Reporting, Decision

Statistical Methods: Arithmetic mean, The Arithmetic mean of grouped Data, The Median, The mode; The variance and standard deviation, Interpretation of SD, Chebyshev's Lemma or Rule (for sample), Skewness and Kurtosis, Skewness and its measurement, Kurtosis and its measurements.

Probability Distribution & Statistical Inference: Elements of Probability, Random Variable, Probability distribution/density functions (Normal, Binomial, Poisson), Point Estimate, Interval Estimate, Testing of hypothesis

UNIT – II

Visualization: Comparison, Distribution, Relationship, Composition, Visual Charts – Bar chart, Column chart, variable width column chart, Line chart, Column histogram, Line histogram, Scatter chart, stacked column chart, stacked 100% column chart, waterfall chart, pie chart, stacked area chart, 3D area chart, stacked 100% area chart, Bubble chart, Geometric Forms, Pictorial Diagrams, ParetoDiagrams

Applications: Graphical representation of data from Battery health monitoring, Indoor Air Quality, CO2 emissions by country/region (Practice using MS-Excel & R/Python)

UNIT – III

Time series Analysis: Characteristics Movements in a time series; Time series models; Measurement of Trend; Secular Trend; Seasonal Movements; Cyclical Movements; Irregular Movements; Long Cycles,

Applications: Analyze the trends of population growth, global temperatures, solar radiation, wind patterns. (Practice using MS-Excel & R/Python).

UNIT – IV

Business Intelligence and Analytics: What is Business Intelligence and Analytics? The need for BI and analytics, how to determine requirements, Using the BI tools for extracting insights for data driven decisions

Microsoft Power BI - Part I: Understanding key concepts in business intelligence, data analysis, and data visualization. Getting Started with Power BI and Analytics - Creating account, Power BI Desktop, Working with Data - Connect, Import, Shape and Transform data, Creating Visualization, Author Reports and Schedule automated refresh of reports, Publishing Data to BI



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online, Using Quick Insights, Use natural language queries, Create real-time dashboards, Create custom visualizations which can be re-usable in reports and dashboards, Sharing dashboard effectively based on needs.

UNIT – V

Microsoft Power BI - Part II: Exploring live connections to data with Power BI, connecting directly to data bases, Introduction to Power BI Development API, Leveraging custom visuals in Power BI, Introduction to DAX

TEXTBOOKS:

1. Statistics Concepts and applications, Nabendu pal & Sahadeb sarkar, PHI Learning Pvt. Ltd.,2008.
2. Effective Data Visualization: The Right Chart for the Right Data 1st Edition, Dr. Stephanie D. H. Evergreen, SAGE Publications
3. Introducing Microsoft Power BI, Alberto Ferrari and Marco Russo,2016.

REFERENCE BOOKS

1. Applied Microsoft Power BI: Bring your data to life! Teo Lachev,2015
2. Microsoft Power BI guided learning.

Course Outcomes:

The student will be able to

- Understand the essentials of data analytics and the corresponding terminologies
- Determine the relevance of data to business
- Be familiar with the steps involved in the analytics process
- Understand and use statistical and graphical analysis to bring insights out from the data
- Understand and use BI tools to present data in the form of Dashboards and reports



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III Year - II Semester		L	T	P	C
		3	0	0	3
PATTERN RECOGNITION (Professional Elective 2)					

Course Objectives

- To equip students with basic mathematical and statistical techniques commonly used in Pattern recognition.
- To introduce students to a variety of pattern recognition algorithms.
- Enable students to apply machine learning concepts in real life problems.

Unit I

Introduction to Pattern Recognition: Problems, applications, design cycle, learning and adaptation, examples, Probability Distributions, Parametric Learning - Maximum likelihood and Bayesian Decision Theory- Bays rule, discriminate functions, loss functions and Bayesian error analysis

Unit II

Linear models: Linear Models for Regression, linear regression, logistic regression Linear Models for Classification

Unit III

Neural Network: perception, multi-layer perception, back propagation algorithm, error surfaces, practical techniques for improving back propagation, additional networks and training methods, Ad boost, Deep Learning

Unit IV

Linear discriminate functions - decision surfaces, two-category, multi-category, minimum-squared error procedures, the Ho-Kashyap procedures, linear programming algorithms, Support vector machine

Unit V

Algorithm independent machine learning – lack of inherent superiority of any classifier, bias and variance, re-sampling for classifier design, combining classifiers

Unsupervised learning and clustering – k-means clustering, fuzzy k-means clustering, hierarchical clustering

TEXT BOOKS:

1. Richard O. Duda, Peter E. Hart, David G. Stork, “Pattern Classification”, 2nd Edition John Wiley & Sons, 2001.
2. Machine learning by Saikat Dutt, S. Chandramouli and A.K.Das , Pearson publishing, 2018.



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REFERENCE BOOKS:

1. C. Bishop, “Pattern Recognition and Machine Learning”, Springer,2006
2. Trevor Hastie, Robert Tibshirani, Jerome H. Friedman, “The Elements of Statistical Learning”, 2nd Edition, Springer,2009.

Course Outcomes:

At the end of this course, students will be able to

- Study the parametric and linear models for classification
- Design neural network and SVM for classification
- Develop machine independent and unsupervised learning techniques.



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		3	0	0	3
ROBOTICS and AUTOMATION (Professional Elective 2)					

OBJECTIVE:

To impart knowledge about basic mathematics related to industrial robots for their control, design and application in robotics & automation Industries.

UNIT – I**Introduction to Robotics**

Types and components of a robot, classification of robots

Study components of an industrial robot (PUMA, KUKA, FANUC, MTAB, UR, etc.) and its DH parameters.

UNIT – II**Robot Kinematics and Dynamics:**

Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, DH parameters, Forward and inverse kinematics, Jacobian, Singularity, and Statics.

Dynamic Modelling: Forward and inverse dynamics, Equations of motion using Euler-Lagrange formulation, Newton Euler formulation.

Sensors

Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc. Introduction to Cameras, Camera calibration, Geometry of Image formation, Euclidean / Similarity / Affine / Projective transformations, Vision applications in robotics

UNIT – III**Robot Actuation Systems**

Actuators: Electric, Hydraulic and Pneumatic; Transmission: Gears, Timing Belts and Bearings, Parameters for selection of actuators.

Robot Control:

Robot control, Independent joint control, PD and PID feedback, actuator models, nonlinearity of manipulator models, issues in nonlinear control, force feedback, hybrid control, Motion Planning, Obstacle avoidance, configuration space, road map methods, graph search algorithms, potential field methods

UNIT – IV**Control Hardware and Interfacing:**

Embedded systems: Microcontroller Architecture and integration with sensors, actuators, components, Programming Applications for Industrial robot - programming in – VAL II

Case Study: Bin Picking in Industrial Warehouse.



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UNIT – V

AI in Robotics:

Applications in unmanned systems, defence, medical, industries, Robotics and Automation for Industry 4.0 Robot safety and social robotics

TEXTBOOKS:

1. Introduction to Robotics – Mechanics and Control, John J. Craig, 3rd Edition, Pearson Prentice Hall,2004.
2. Industrial Robots, Groover M. P. and Ashish Dutta, McGrawHill,2012
3. Robots Dynamics & Control, Spong M. W. and Vidyasagar M., John Wiley & Sons (ASIA) PteLtd.

REFERENCE BOOKS

1. Introduction to Robotics: Analysis, Control, Applications, Saeed B. Niku, 3rd Edition, Wiley,2019
2. Robotics Engineering, R. Klafter,PHI.
3. Robotics, Subir K. Saha, McGrawHill.

Course Outcomes:

The student will be able to:

- Perform kinematic and dynamic analyses withsimulation.
- Design control laws for a simplerobot.
- Integrate mechanical and electrical hardware for a real prototype of roboticdevice.
- Select a robotic system for given industrialapplication.



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III Year - II Semester		L	T	P	C
		3	0	0	3
Data Mining Open Elective (OE1)					

Course objectives:

The main objectives of this course are:

- Students will be enabled to understand and implement classical models and algorithms in data warehousing and datamining.
- They will learn how to analyze the data, identify the problems, and choose the relevant models and algorithms to apply.
- They will further be able to assess the strengths and weaknesses of various methods and algorithms and to analyze their behavior.

UNIT-I:

INTRODUCTION: Need of Data Warehouse, Need and Usage of Data Mining Technologies, Types of Data and Patterns to be mined, In Real Time Applications. Brief Introduction of Pattern Recognition: Pattern, Feature, Database Query Vs Mining, Curse of Dimensionality, Need for Efficiency. Major Issues in Data Mining. Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity

UNIT-II:

DATA PRE-PROCESSING: Data Preprocessing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization

UNIT-III:

CLASSIFICATION: Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Working of Decision Tree, building a decision tree, methods for expressing an attribute test conditions, measures for selecting the best split, Algorithm for decision tree induction. Bayes' Theorem, Naïve Bayesian Classification, Bayesian Belief Networks

UNIT-IV:

ASSOCIATION ANALYSIS: BASIC CONCEPTS AND ALGORITHMS: Problem Defecation, Frequent Item Set generation, Rule generation, compact representation of frequent item sets, FP-Growth Algorithm. (**Tan & Vipin**)



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UNIT–V:

CLUSTER ANALYSIS: BASIC CONCEPTS AND ALGORITHMS: OVERVIEW: Basics and Importance of Cluster Analysis, Clustering techniques, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bisecting K-means, Strengths and Weaknesses; Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm DBSCAN: Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses. **(Tan&Vipin)**

TEXT BOOKS:

1. Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Pearson.
2. Data Mining concepts and Techniques, 3/e, Jiawei Han, Michel Kamber, Elsevier.

REFERENCE BOOKS:

1. Data Mining Techniques and Applications: An Introduction, Hongbo Du, Cengage Learning.
 2. Data Mining: Vikram Pudi and P. Radha Krishna, Oxford.
 3. Data Mining and Analysis - Fundamental Concepts and Algorithms; Mohammed J. Zaki, Wagner Meira, Jr, Oxford
 4. Data Warehousing Data Mining & OLAP, Alex Berson, Stephen Smith, TMH.
 5. http://onlinecourses.nptel.ac.in/noc18_cs14/preview
(NPTEL course by Prof. Pabitra Mitra)
 6. http://onlinecourses.nptel.ac.in/noc17_mg24/preview
(NPTEL course by Dr. Nandan Sudarshanam & Dr. Balaraman Ravindran)
- http://www.saedsayad.com/data_mining_map.htm

Course Outcomes:

At the end of this course the student will be able to:

- Understand Data Mining Principles
- Identify appropriate data mining algorithms to solve real world problems
- Compare and evaluate different data mining techniques like classification, prediction, clustering and association rule mining



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III Year - II Semester		L	T	P	C
		3	0	0	3
POWER ELECTRONICS Open Elective (OE1)					

Course objectives:

The main objectives of this course are:

- To study the characteristics of various power semiconductor devices and gate drive circuits.
- To understand the operation of single phase full-wave converters and analyze harmonics in the input current.
- To study the operation of three phase full-wave converters.
- To understand the operation of different types of DC-DC converters.
- To understand the operation of inverters and application of PWM techniques for voltage control and harmonic mitigation.

UNIT-I:

Power Semiconductor Devices: Operation of SCR, power MOSFET and power IGBT and their characteristics–Gate drive circuits for SCR, IGBT and MOSFET–protection circuits for power IGBT and power MOSFETs.

UNIT-II:

AC-DC Single-Phase Converters: 1-phase fully-controlled bridge rectifiers feeding R load, RL, RLE loads (continuous and discontinuous current conduction mode of operation)– 1-phase semi-controlled bridge rectifiers feeding R, RL and RLE loads (continuous and discontinuous current conduction mode of operation)– Harmonic Analysis.

UNIT-III:

AC-DC Three-Phase Converters: 3-phase Full converter feeding R, RL and RLE loads (continuous current conduction mode only)– 3-phase semi-converter feeding R, RL and RLE loads (continuous current conduction mode only)–Harmonic analysis -Dual converter.

UNIT-IV:

DC-DC Converters: Analysis of Buck, boost, buck-boost converters in Continuous Conduction Mode (CCM) and Discontinuous Conduction Modes (DCM) – Output voltage equations using volt-sec balance in CCM & DCM- output voltage ripple & inductor current ripple for CCM only – Principle operation of forward and fly back converters in CCM.



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UNIT – V:

DC–AC Converters and AC-AC converters: 1- phase half-bridge and full bridge inverters with R and RL loads – Unipolar and bipolar switching-Quasi-square wave pulse width modulation-3-phase square wave inverters – 120° conduction and 180° conduction modes of operation – Sinusoidal pulse width modulation –single-phase Current Source Inverter (CSI)-single-phase AC-AC voltage regulator with R and RLload.

TEXT BOOKS:

1. Power Electronics: converters, applications & design -by Nedmohan, Tore M.Undeland, Robbins by Wiley India Pvt.Ltd.
2. Power Electronics- by Daniel W.Hart, Mc Graw Hillpublications
3. Power Electronics: Circuits, Devices and Applications – by M. H. Rashid, Prentice Hallof India

REFERENCE BOOKS:

1. Power Electronics: Essentials & Applications by L.Umanand, Wiley, Pvt. Limited, India,2009
2. Elements of Power Electronics–Philip T.Krein. Oxfordpublishers.
3. Power Electronics – by P.S.Bhimbra, KhannaPublishers.

Course Outcomes:

At the end of this course the student will be able to:

- Explain the characteristics of various power semiconductor devicesand understand the gate drivercircuits.
- Explain the operation of single-phase full wave converters and performharmonic analysis.
- Explain the operation of three phase full–wave converters and performharmonic analysis.
- Analyze the operation of different types of DC-DCconverters.
- Explain the operation of inverters and application of PWM techniques for voltagecontrol and harmonicmitigation.



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III Year - II Semester		L	T	P	C
		3	0	0	3
MEMS and its applications Open Elective (OE1)					

Course objectives:

- To introduce the basic concepts of micro systems and advantages of miniaturization.
- To study the various materials and their properties used for micromachining techniques.
- To analyze the fundamentals of micromachining and micro fabrication techniques.
- To impart knowledge of the basic concept of electromechanical effects, thermal effects, Micro fluidics and Integrated fluidic systems.
- To study the fundamentals of pressure sensors and accelerometer sensors through design and modeling.

UNIT I: Overview of MEMS and Microsystems: MEMS and Microsystems, Typical MEMS and Microsystem products, Evolution of Microfabrication, Microsystem and Microelectronics, The Multidisciplinary nature of microsystem design and manufacture, Microsystem and Miniaturization. Application of Microsystems in the automotive industry, Application of Microsystems in other industries: Health care industry, Aerospace industry, Industrial products, Consumer products, Telecommunications. Markets for Microsystems.

UNIT II: Working Principles of Microsystems: Introduction, Microsensors: Acoustic Wave Sensors, Biomedical sensors and Biosensors, Chemical sensors, Pressure sensors, Thermal sensors. Micro actuation: Actuation using thermal forces, shape memory alloys, Piezoelectric crystals, Electrostatic forces. MEMS with Micro actuators: Microgrippers, Micromotors, Microvalves, Micropumps, Micro accelerators, Microfluidics.

UNIT III: Scaling Laws in Miniaturization: Introduction to scaling, Scaling in Geometry, Scaling in Rigid-Body Dynamics, Scaling in Electrostatic Forces, Scaling in Electromagnetic Forces, Scaling in Electricity, Scaling in Fluid Mechanics, Scaling in Heat Transfer.

Materials for MEMS and Microsystems: Introduction, Substrates and wafers, Active substrate materials, Silicon as a substrate material. Silicon compounds, Silicon piezo resistors, Gallium Arsenide, Quartz, Piezoelectric crystals, Polymers, Packaging materials.



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UNIT IV: Micro system Fabrication Process: Photolithography, Ion Implantation, Diffusion, Oxidation, Chemical Vapour Deposition, Physical Vapour Deposition, Deposition by Epitaxy, Etching.

Overview of Micro manufacturing and Applications: Bulk Micro manufacturing- any one example of application, Surface Micromachining- any one example of application. LIGA Process- any one example of application.

UNIT V: Applications of MEMS-Switching: Introduction, Switch parameters, Basics of switching, Mechanical switches, Electronic switches for RF and microwave applications, Mechanical RF switches, PIN diode RF switches.

Text Books:

1. Tai-Ran Hsu, “MEMS and Microsystems: Design and Manufacture”, Tata McGraw Hill, (2002).
2. Gabriel M. Rebeiz, “RF MEMS Theory, Design and Technology”, Wiley India Pvt Ltd.

Reference Books:

1. Stephen D. Senturia, “Microsystem Design”, Springer International Edition, (2010).
2. Mohamed Gad-el-Hak, “The MEMS Handbook”, CRC Press, (2002).
3. Chang Liu, “Foundations of MEMS”, Second Edition, Pearson Publication.

E-resources:

1. <https://nptel.ac.in/courses/117105082/4>
2. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-777j-design-and-fabrication-of-microelectromechanical-devices-spring-2007/lecture-notes/>
3. <https://www.edx.org/course/micro-nanofabrication-mems-epflx-memsx-0>

Course Outcomes:

- Understand the basic overview of MEMS and Microsystems with broad category of MEMS & Micro system applications.
- Understanding the working principles of Microsystems
- Understand the Scaling Laws in Miniaturization and Materials for MEMS and Microsystems
- Understand the Micro system Fabrication Process and Analyze the different Micro manufacturing process and Applications.
- Study and Analyze the different types of RF switches, Various Switching Mechanism and their applications..



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III Year - II Semester	L	T	P	C
	3	0	0	3
Artificial Neural Networks Open Elective (OE1)				

Course objectives:

The main objectives of this course are:

- To provide an introduction to the field of artificial neural networks and machine learning.
- To teach students how to solve practical problems via implementation of these techniques via simulation.
- To promote further independent learning on the topics of artificial neural networks and machine learning.

UNIT-I:

INTRODUCTION: History of Neural Networks, Structure and Functions of Biological and Artificial Neuron, Neural Network Architectures, Characteristics of ANN, Basic Learning Laws and Methods.

UNIT-II:

SUPERVISED LEARNING: Single Layer Neural Network and architecture, McCulloch-Pitts Neuron Model, Learning Rules, Perceptron Model, Perceptron Convergence Theorem, Delta learning rule, ADALINE, Multi-Layer Neural Network and architecture, MADALINE, Back Propagation learning, Back Propagation Algorithm.

UNIT-III:

UNSUPERVISED LEARNING-1: Outstar Learning, Kohonen Self Organization Networks, Hamming Network And MAXNET, Learning Vector Quantization, Mexican hat.

UNIT-IV:

UNSUPERVISED LEARNING-2: Counter Propagation Network -Full Counter Propagation network, Forward Only Counter Propagation Network, Adaptive Resonance Theory (ART) - Architecture, Algorithms.

UNIT V:

ASSOCIATIVE MEMORY NETWORKS: Introduction, Auto Associative Memory, Hetero Associative Memory, Bidirectional Associative Memory (BAM) -Theory and Architecture, BAM Training Algorithm, Hopfield Network: Introduction, Architecture of Hopfield Network.



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TEXT BOOKS:

1. B. Yegnanarayana” Artificial neural networks” PHI, New Delhi.
2. S.N. Sivanandam, S.N. Deepa, “Introduction to Neural Networks using MATLAB6.0“, TATA MCGraw- Hillpublications.
3. J.M. Zurada,” Introduction to Artificial neural systems” –Jaicopublishing.

REFERENCE BOOKS:

1. S.Rajasekaran and G.A.Vijayalakshmpai “Neural Networks.Fuzzy Logicand genetic Algorithms”.
2. James A Freeman and Davis Skapura” Neural Networks Algorithm, applications and programming Techniques”, Pearson Education,2002.
3. Simon Hakins “Neural Networks “ PearsonEducation.

Course Outcomes:

At the end of this course the student will be able to:

- Survey of attractive applications of Artificial NeuralNetworks.
- practically approach for using Artificial Neural Networks in various technical, organizational and economicapplications



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III Year - II Semester		L	T	P	C
		3	0	0	3
INTERNET OF THINGS					

Course Objectives:

- To learn and understand elements of IoT system.
- Acquire knowledge about various protocols of IoT.
- To learn and understand design principles and capabilities of IoT.

UNIT I: Introduction to IoT

Introduction to IoT, Architectural Overview, Design principles and needed capabilities, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Data management, Business processes in IoT, Everything as a Service (XaaS), Role of Cloud in IoT, Security aspects in IoT.

UNIT II: Elements of IoT

Hardware Components- Computing- Arduino, Raspberry Pi, ARM Cortex-A class processor, Embedded Devices – ARM Cortex-M class processor, ARM Cortex-M0 Processor Architecture, Block Diagram, Cortex-M0 Processor Instruction Set, ARM and Thumb Instruction Set.

UNIT III: IoT Application Development

Communication, IoT Applications, Sensing, Actuation, I/O interfaces.

Software Components- Programming API's (using Python/Node.js/Arduino) for Communication Protocols-MQTT, ZigBee, CoAP, UDP, TCP, Bluetooth.

Bluetooth Smart Connectivity

Bluetooth overview, Bluetooth Key Versions, Bluetooth Low Energy (BLE) Protocol, Bluetooth, Low Energy Architecture, PSoC4 BLE architecture and Component Overview.

UNIT IV: Solution framework for IoT applications

Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, authorization of devices.

UNIT V: IoT Case Studies

IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation.

Text Books:

1. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017.
2. The Definitive Guide to the ARM Cortex-M0 by Joseph Yiu, 2011
3. Vijay Madiseti, Arshdeep Bahga, Internet of Things, "A Hands on Approach", University Press, 2015.



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References:

1. Cypress Semiconductor/PSoC4 BLE (Bluetooth Low Energy) Product Training Modules.
2. Pethuru Raj and Anupama C. Raman, “The Internet of Things: Enabling Technologies, Platforms, and Use Cases”, CRC Press, 2017.

Course Outcomes:

The student will be able to:

- Understand internet of Things and its hardware and software components.
- Interface I/O devices, sensors & communication modules.
- Remotely monitor data and control devices.
- Design real time IoT based applications



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III Year - II Semester		L	T	P	C
		0	0	3	1.5
VLSI LAB					

List of Experiments

PART (A): FPGA Level Implementation (Any Seven Experiments)

Note 1: The students need to develop Verilog /VHDL Source code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary Synthesizer.

Note 2: All the experiments need to be implemented on the latest FPGA/CPLD Hardware in the Laboratory

1. Realization of Logic gates

Design and Implementation of the following:

2. 4-bit ripple carry and carry look ahead adder using behavioural, dataflow and structural modeling
3. a) 16:1 mux through 4:1 mux
b) 3:8 decoder realization through 2:4 decoder
4. 8:3 encoder
5. 8-bit parity generator and checker
6. Flip-Flops
7. 8-bit synchronous up-down counter
8. 4-bit sequence detector through Mealy and Moore state machines.

EDA Tools/Hardware Required:

1. EDA Tool that supports FPGA programming including Xilinx Vivado /Altera (Intel)/ Cypress/Equivalent Industry standard tool along with corresponding FPGA hardware.
2. Desktop computer with appropriate Operating System that supports the EDA tools.

PART (B): Back-end Level Design and Implementation (Any Five Experiments)

Note: The students need to design the following experiments at schematic level using CMOS logic and verify the functionality. Further students need to draw the corresponding layout and verify the functionality including parasites. Available state of the art technology libraries can be used while simulating the designs using Industry standard EDA Tools.

Design and Implementation of the following

- a. Universal Gates
- b. An Inverter
2. Full Adder
3. Full Subtractor



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4. Decoder
5. D-Flip-flop

EDA Tools/Hardware Required:

- Mentor Graphics Software / Cadence/Synopsys/Tanner or Equivalent Industry Standard/CAD Tool.
- Desktop computer with appropriate Operating System that supports the EDA tools.



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III Year - II Semester		L	T	P	C
		0	0	3	1.5
DIGITAL SIGNAL PROCESSING LAB					

(Note: Students have to perform at least FOUR experiments from each part.)

PART-A

List of the Experiments

1. Generation of DT signals.
2. Verify the Linear Convolution of two DT signals
 - a) Using MATLAB
 - b) Using Code Composer Studio (CCS)
3. Verify the Circular Convolution of two DT signals
 - a) Using MATLAB
 - b) Using Code Composer Studio (CCS)
4. Find the sum of DT sinusoidal signals.
5. Computation of Discrete Fourier Transform (DFT) and Inverse Discrete Fourier Transform (IDFT)
 - a) Using MATLAB
 - b) Using Code Composer Studio (CCS)
6. Transfer Function Stability Analysis: using pole-zero plot, bode plot and Nyquist plot.

PART-B

Following Experiments are to be done using a TI DSP Starter Kit.

7. Generation of a sinusoidal signal.
8. Linear and circular convolution of DT sequences.
9. Compute N-point DFT of a given DT sequence.
10. Design and implementation of FIR filters.
11. Design and implementation of IIR filters.

PART-C

Following Experiments are to be done using **Cypress FM4 Starter Kit**.

12. Verification of sampling theorem.
13. Implementation of FFT algorithm.
14. Implementation of FIR filters.
15. Implementation of IIR filters.



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III Year - II Semester	L	T	P	C
	3	0	0	0
Intellectual Property Rights (IPR) & Patents				

UNIT I

Introduction to Intellectual Property Rights (IPR): Concept of Property - Introduction to IPR – International Instruments and IPR - WIPO - TRIPS – WTO -Laws Relating to IPR - IPR Tool Kit - Protection and Regulation - Copyrights and Neighboring Rights – Industrial Property – Patents - Agencies for IPR Registration – Traditional Knowledge –Emerging Areas of IPR - Layout Designs and Integrated Circuits – Use and Misuse of Intellectual PropertyRights.

UNIT II

Copyrights and Neighboring Rights: Introduction to Copyrights – Principles of Copyright Protection – Law Relating to Copyrights - Subject Matters of Copyright – Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of Performers – Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Case Law - Semiconductor Chip ProtectionAct.

UNIT III

Patents: Introduction to Patents - Laws Relating to Patents in India – Patent Requirements – Product Patent and Process Patent - Patent Search - Patent Registration and Granting of Patent - Exclusive Rights – Limitations - Ownership and Transfer — Revocation of Patent – Patent Appellate Board - Infringement of Patent – Compulsory Licensing — Patent Cooperation Treaty – New developments in Patents – Software Protection and Computer relatedInnovations

UNIT IV

Trademarks: Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – Distinction between Trademark and Property Mark – Marks Covered under Trademark Law - Trade Mark Registration – Trade Mark Maintenance – Transfer of rights - Deceptive Similarities

Likelihood of Confusion - Dilution of Ownership – Trademarks Claims and Infringement – Remedies – Passing Off Action.



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UNIT V

Trade Secrets & Cyber Law and Cyber Crime: Introduction to Trade Secrets – General Principles
- Laws Relating to Trade Secrets–

Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreements – Breach of Contract –Law of Unfair Competition – Trade Secret Litigation – Applying State Law.

Cyber Law – Information Technology Act 2000 - Protection of Online and Computer Transactions –

E-commerce - Data Security – Authentication and Confidentiality - Privacy - Digital Signatures – Certifying Authorities - Cyber Crimes - Prevention and Punishment – Liability of Network Providers.

References:

- 1) Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, NewDelhi.
- 2) Deborah E.Bouchoux: Intellectual Property, Cengage Learning, NewDelhi.
- 3) PrabhuddhaGanguli: Intellectual Property Rights, Tata Mc-Graw –Hill, NewDelhi
- 4) Richard Stim: Intellectual Property, Cengage Learning, NewDelhi.
- 5) Kompal Bansal &Parishit Bansal Fundamentals of IPR for Engineers, B. S. Publications (Press).
- 6) Cyber Law - Texts & Cases, South-Western’s Special TopicsCollections.
- 7) R.Radha Krishnan, S.Balasubramanian: Intellectual Property Rights, Excel Books. New Delhi.
- 8) M.Ashok Kumar and MohdIqbal Ali: Intellectual Property Rights, SerialsPub.

Course Outcomes:

- IPR Laws and patents pave the way for innovative ideas which are instrumental for inventions to seek Patents
- Student get an insight on Copyrights, Patents and Software patents which are instrumental for further advancements
- advanced Technical and Scientific disciplines
- Imparting IPR protections and regulations for further advancement, so that the students can familiarize with the latest developments



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IV Year - I Semester		L	T	P	C
		3	0	0	3
MICROWAVE and OPTICAL COMMUNICATION ENGINEERING					

Course Objectives:

The student will be able to

- Understand fundamental characteristics of waveguides and Micro strip lines through electromagnetic field analysis.
- Understand the basic properties of waveguide components and Ferrite materials composition
- Understand the function, design, and integration of the major microwave components oscillators, power amplifier.
- Understand a Microwave test bench setup for measurements.

UNIT I

MICROWAVE TUBES (Qualitative treatment only): Cavities, Re-entrant Cavities, Two Cavity Klystrons-Structure, Velocity Modulation and Bunching process, Reflex Klystrons-Structure, principle of working.

HELIX TWTS: Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT.

M-TYPE TUBES

Introduction, Cross-field effects, Magnetrons – 8-Cavity Cylindrical Travelling Wave Magnetron.

MICROWAVE SOLID STATE DEVICES: Introduction, Classification, Applications. TEDs – Introduction, Gunn Diode – Principle, RWH Theory, Characteristics, LSA Mode of operation

UNIT II

WAVEGUIDE COMPONENTS AND APPLICATIONS- I (Qualitative treatment only):

Waveguide Attenuators – Resistive Card, Rotary Vane types, Scattering matrix parameters: Definition, Properties, Salient Features -S- parameters of two port, three port, four port networks. 2 Hole, Bethe Hole types.

UNIT III Over view of optical fiber communication, Total Internal Reflection, Numerical Aperture, Graded index fibers, Cut off wavelength.

OPTICAL FIBER CONNECTORS-Connector types, Single mode fiber connectors, Connector return loss, Fiber Splicing- Splicing techniques, Splicing single mode fibers, Multimode fiber joints, single mode fiber joints.



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UNIT I V

OPTICAL SOURCES and Detectors: Qualitative treatment, Structures, Materials, Quantum efficiency, Physical principles and comparison of: Optical sources and detectors, Related problems.

Optical system design- Point to point links – Component Choice and considerations, Link power budget, Line coding in Optical links, WDM, Necessity, Principles, Eye pattern.

UNIT –V: MEASUREMENTS:

a. MICROWAVE MEASUREMENTS: Description Of Microwave Bench- Different Blocks, Microwave Power Measurement- Bolometer Method. Measurement of Attenuation by Reflection Method, VSWR, Impedance Measurement

b. OPTICAL MEASUREMENTS: OTDR, Attenuation, Detector Characteristics

TEXT BOOKS :

1. Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rd Edition, 1994.
2. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.
3. Optical Fiber Communications – Gerd Keiser, Mc Graw-Hill International edition, 3rd Edition, 2000.

REFERENCES :

1. Microwave Engineering- Annapurna Das and Sisir K. Das, Mc Graw Hill Education, 3rd Edition, 2014.
2. Microwave Engineering – G S N Raju , I K International Publishing House Pvt. Limited, 2008.
3. Fiber Optic Communication Systems – Govind P. Agarwal , John Wiley, 3rd Edition, 2004.

Course Outcomes: After going through this course the student will be able to

- Design different modes in waveguide structures
- Calculate S-matrix for various waveguide components and splitting the microwave energy in a desired direction
- Distinguish between Microwave tubes and Solid State Devices, calculation of efficiency devices.
- Measure various microwave parameters using a Microwave test bench



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IV Year - I Semester		L	T	P	C
		3	0	0	3
DATA COMMUNICATIONS & COMPUTER NETWORKS					

Course Objectives:

- To introduce the Fundamentals of data communication networks
- To demonstrate the Functions of various protocols of Data link layer.
- To demonstrate Functioning of various Routing protocols.
- To introduce the Functions of various Transport layer protocols.
- To understand the significance of application layer protocols

UNIT I:

Introduction to Data Communications: Components, Data Representation, Data Flow, Networks-Distributed Processing, Network Criteria, Physical Structures, Network Models, Categories of Networks Interconnection of Networks, The Internet - A Brief History, The Internet Today, Protocol and Standards - Protocols, Standards, Standards Organizations, Internet Standards. Network Models, Layered Tasks, OSI model, Layers in OSI model, TCP/IP Protocol Suite, Addressing Introduction, Wireless Links and Network Characteristics, WiFi: 802.11 Wireless LANs -The 802.11 Architecture,

UNIT II:

Data Link Layer: Links, Access Networks, and LANs- Introduction to the Link Layer, The Services Provided by the Link Layer, Types of errors, Redundancy, Detection vs Correction, Forward error correction Versus Retransmission Error-Detection and Correction Techniques, Parity Checks, Check summing Methods, Cyclic Redundancy Check (CRC) , Framing, Flow Control and Error Control protocols , Noisy less Channels and Noisy Channels, HDLC, Multiple Access Protocols, Random Access ,ALOHA, Controlled access, Channelization Protocols. 802.11 MAC Protocol, IEEE 802.11 Frame.

UNIT III:

The Network Layer: Introduction, Forwarding and Routing, Network Service Models, Virtual Circuit and Datagram Networks-Virtual-Circuit Networks, Datagram Networks, Origins of VC and Datagram Networks, Inside a Router-Input Processing, Switching, Output Processing, Queuing, The Routing Control Plane, The Internet Protocol(IP):Forwarding and Addressing in the Internet-Datagram format, Ipv4 Addressing, Internet Control Message Protocol(ICMP), IPv6



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UNIT IV:

Transport Layer: Introduction and Transport Layer Services : Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and Demultiplexing, Connectionless Transport: UDP -UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer-Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N(GBN), Selective Repeat(SR), Connection Oriented Transport: TCP - The TCP Connection, TCP Segment Structure, Round-Trip Time Estimation and Timeout, Reliable Data Transfer, Flow Control, TCP Connection Management, Principles of Congestion Control - The Cause and the Costs of Congestion, Approaches to CongestionControl

UNIT V:

Application Layer: Principles of Networking Applications – Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the File Transfer: FTP,- FTP Commands and Replies, Electronic Mail in the Internet-STMP, Comparison with HTTP, DNS-The Internet’s Directory Service – Service Provided by DNS, Overview of How DNS Works, DNS Records andmessages.

TEXT BOOKS:

1. Computer Networking A Top-Down Approach – Kurose James F, Keith W, 6thEdition , Pearson,2017.
2. Data Communications and Networking Behrouz A.Forouzan4th Edition McGraw Hill Education,2017.

REFERENCES:

1. Data communication and Networks - Bhusan Trivedi, Oxford university press,2016
2. Computer Networks -- Andrew S Tanenbaum, 4th Edition, PearsonEducation,2003.
3. Understanding Communications and Networks,3rdEdition,W.A.Shay,CengageLearning,2003.

Course Outcomes:

Upon completing this course, the student will be able to

- Know the Categories and functions of various Data communication Networks
- Design and analyze various error detectiontechniques.
- Demonstrate the mechanism of routing the data in networklayer
- Know the significance of various Flow control and Congestion controlMechanisms
- Know the Functioning of various Application layerProtocols.



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IV Year - I Semester		L	T	P	C
		3	0	0	3
DIGITAL IMAGE and VIDEO PROCESSING					

Course Objectives:

- To study the image fundamentals and mathematical transforms necessary for image Processing.
- To study the image enhancement techniques
- To study image restoration procedures.
- To study the image compression procedures.
- To study the basics of Video processing and 2-D Motion estimation

UNIT I:

Fundamentals of Image Processing and Image Transforms:

Introduction, Image sampling, Quantization, Resolution, Image file formats, Elements of image processing system, Applications of Digital image processing. Introduction, Need for transform, image transforms, Fourier transform, 2 D Discrete Fourier transform and its transforms, Importance of phase, Walsh transform, Hadamard transform, Haar transform, slant transform Discrete cosine transform, KL transform, singular value decomposition, comparison of different image transforms.

UNIT II:

Image Enhancement:

Spatial domain methods: point processing techniques, Histogram processing, Fundamentals of Spatial filtering, smoothing spatial filters, sharpening spatial filters. Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering.

Image Restoration:

Introduction to Image restoration, Image degradation, Types of image blur, Classification of image restoration techniques, Image restoration model, Linear and Nonlinear image restoration techniques, Blind de-convolution.

UNIT III:

Image Segmentation:

Introduction to image segmentation, Point, Line and Edge Detection, Region based segmentation., Classification of segmentation techniques, Region approach to image segmentation, clustering techniques, Image segmentation based on thresholding, Edge based segmentation, Edge detection and linking, Hough transform.

Image Compression:

Introduction, Need for image compression, Redundancy in images, Classification of redundancy in images, image compression scheme, Classification of image compression schemes, Fundamentals of information theory, Run length coding, Shannon – Fano coding, Huffman coding, Arithmetic coding, Predictive coding, Transformed based compression, Image



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compression standard, Wavelet-based image compression, JPEG Standards.



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UNIT IV:

Basic Steps of Video Processing:

Analog Video, Digital Video. Time-Varying Image Formation models: Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Video signals, filtering operations.

UNIT V:

Motion Estimation: Optical flow, General Methodologies, Pixel Based Motion Estimation, Block-Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Videocoding.

TEXT BOOKS

1. Digital Image Processing – Gonzaleze and Woods, 3rdEd, Pearson, 2008.
2. Digital Video Processing – M. Tekalp, Prentice Hall International. 2ndEd. 2015.

REFERENCE BOOKS

1. Digital Image Processing – S. Jayaraman, S. Esakkirajan, T. Veera Kumar – TMH, 2009.
2. Video Processing and Communication – Yao Wang, Joem Ostermann and Ya-quin Zhang. 1st Ed., PH Int, 2017
3. Digital Image Processing and Analysis-Human and Computer Vision Application with CVIP Tools – Scotte Umbaugh, 2nd Ed, CRC Press, 2011.

Course Outcomes:

- Defining the digital image, representation of digital image, importance of image resolution, applications in image processing.
- Know the advantages of representation of digital images in transform domain, application of various image transforms.
- Know how an image can be enhanced by using histogram techniques, filtering techniques etc
- Understand image degradation, image restoration techniques using spatial filters and frequency domain
- Know the detection of point, line and edges in images, edge linking through local processing, global processing.
- Understand the redundancy in images, various image compression techniques.
- Know the video technology from analog color TV systems to digital video systems, how video signal is sampled and filtering operations in video processing.
- Know the general methodologies for 2D motion estimation, various coding used in video processing.



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IV Year - I Semester		L	T	P	C
		3	0	0	3
COMMUNICATION STANDARDS and PROTOCOLS (Professional Elective 3)					

Objective:

- Acquire knowledge about transferring data into cloud using various Wired/Wireless communication technologies.

Prerequisites:

Basic knowledge on Digital numbering system; Micro Controller Peripheral Programming, interfacing different types of sensors using I2C, SPI, UART ; wired and wireless communications.

Unit-I:

Introduction to Communication and Networking : Communications, Signal Types and its characteristics (Analog/Digital), Data Transmission Types (Serial/Parallel), Communication Techniques (Asynchronous, Synchronous), Data Transmission Modes (Simplex, Half/Full Duplex), Network Topologies (Star, Ring, Mesh, Point to Point, Tree, Bus, Daisy chain, Multi drop) and its applications, Modulation need and types.

Unit-II:

OSI Layers: Communication Layers and its applications, Communication media (Twisted Pair, Coaxial, Fiber Optics), Introduction to Errors (Error types, Detection, Correction) and Flow Control and its applications.

Unit-III:

Wired Communication Protocols: Ethernet (Types, Socket, MAC, IP, ARP, ICMP, TCP, UDP, DHCP), CAN, Mod-bus (RTU, ASCII), UART (RS485, RS232), OFC and Advantages, Disadvantages and its applications, Introduction to Dial up Modems, Leased line modems.

Unit-IV:

Wireless Communication Protocols: Zigbee, Bluetooth, Wi-Fi, GPRS, GSM , NFC , IR, Satellite Communication. Advantages, Disadvantages and its applications.

Unit-V:

Network Types: Introduction to LAN, WAN, PAN, Internet and Intranet, sensor networks (wired/wireless) and its applications.

Network Security : Introduction to NAT, PAT, DNS, Network Routing algorithms, Introduction to Switch, Hub, Bridges and its working, Network Security and Introduction to Firewall and its applications.



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Text books:

1. Introduction to data communication and networking by Wayne Tomasi, PearsonPrentice Hall,2005
2. Introduction to data communication and networking by Behrouz Forouzan ,4thEdition McGraw HillEducation,2017.
3. Basics of data communications by WilliamStallings.

Reference books:

1. Basics of computer networking by Thomas Robertazzi Stony BrookUniversity,2011
2. Wireless Networking Absolute Beginner's Guide by MichaelMiller:
3. Designing and Deploying 802.11n Wireless Networks by Jim Geier 2nd Edition, Kindle Edition.
4. CAN System Engineering from Theory to Practical Applications,2nd Edition,Springer,2013

Course Outcomes:

- Able to develop sensornetworks
- Able to communicate data via Wired/Wirelesscommunication
- Configure and test communicationtechnologies



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IV Year - I Semester		L	T	P	C
		3	0	0	3
ANALOG IC DESIGN (Professional Elective 3)					

Course Objectives:

The student will be able to

- Understand the behavior of MOS Devices and Small-Signal & Large-Signal Modeling of MOS Transistor and Analog Sub-Circuits.
- Learn and understand CMOS Amplifiers like Differential Amplifiers, Cascode Amplifiers, Output Amplifiers, and Operational Amplifiers.
- Design and Develop the Analog CMOS Circuits for different Analog operations.
- Learn and understand the concepts of Open-Loop Comparators and Different Types of Oscillators like Ring Oscillator, LC Oscillator etc.

UNIT -I:

MOS Devices and Modelling: The MOS Transistor, Passive Components- Capacitor & Resistor, Integrated circuit Layout, CMOS Device Modelling - Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Computer Simulation Models, Sub-threshold MOS Model.

UNIT -II:

Analog CMOS Sub-Circuits: MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors-Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Band gap Reference.

UNIT -III:

CMOS Amplifiers: Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures.

CMOS Operational Amplifiers: Design of CMOS Op Amps, Compensation of Op Amps, Design of Two-Stage Op Amps, Power- Supply Rejection Ratio of Two-Stage Op Amps, Cascode Op Amps, Measurement Techniques of OP Amp.

UNIT -IV:

Comparators: Characterization of Comparator, Two-Stage, Open-Loop Comparators, Other Open-Loop Comparators, Improving the Performance of Open-Loop Comparators, Discrete-Time Comparators.

UNIT -V:

Oscillators & Phase-Locked Loops: General Considerations, Ring Oscillators, LC Oscillators, Voltage Controlled Oscillators.

Simple PLL, Charge Pump PLLs, Non-Ideal Effects in PLLs, Delay Locked Loops, Applications.



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TEXT BOOKS:

1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition, Second Edition.
2. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.

REFERENCES:

1. Analysis and Design of Analog Integrated Circuits- Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, Wiley India, Fifth Edition, 2010.
2. Analog Integrated Circuit Design- David A. Johns, Ken Martin, Wiley Student Edn, 2013.

Course Outcomes:

After going through this course, the student will be able to

- Model and simulate different MOS Devices using small signal Model.
- Design and analyze any Analog Circuits in real time applications.
- Apply the concepts Analog Circuit Design to develop various Applications in Real Time.
- Analyze and compare different Open-Loop Comparators and Oscillators.



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IV Year - I Semester		L	T	P	C
		3	0	0	3
SMART SENSORS (Professional Elective 3)					

OBJECTIVE:

To make student to acquire the knowledge on types of sensors/transducers, working principles, selection procedure, applications of sensing systems

UNIT – I

Introduction to Measurement: Measurement units, applications, elements, choosing appropriate measuring instruments. Instrument Types and Performance Characteristics: Review of instrument types, Static characteristics, dynamic characteristics

Error during measurement process: Sources of systematic error, reduction and quantification of systematic errors, random errors, aggregation of measurement system errors.

Calibration: Calibration of measuring instruments, Primary calibration, secondary calibration and field calibration. Calibration methods for different parameters (temperature, pressure, humidity, flow...etc.). Automatic Calibration mechanisms.

UNIT – II

Temperature Sensors: Thermo-resistive, Resistance Temperature Detectors, Silicon Resistive, Thermistors, Semiconductor, Optical, Acoustic, Piezoelectric

Humidity and Moisture Sensors: Capacitive, Electrical Conductivity, Thermal Conductivity, Optical Hygrometer, Time Domain Reflectometer.

Pressure and Force Sensors: Mercury Pressure, Bellows, Membranes, and Thin Plates, Piezoresistive, Capacitive, Optoelectronic, Vacuum, Strain Gauges, Tactile, Piezoelectric Force

Applications: Case studies in processing industries, indoor environment monitoring in offices, cold storages

UNIT – III

Occupancy and Motion Detectors: Ultrasonic, Microwave Motion, Capacitive Occupancy, Visible and Near-Infrared Light, Far-Infrared Motion, PIR Motion, Position, Displacement, and Level Sensors: Potentiometric, Gravitational, Capacitive, Inductive and Magnetic, Optical, Ultrasonic, Radar

Velocity and Acceleration Sensors: Capacitive Accelerometers, Piezoresistive Accelerometers, Piezoelectric Accelerometers, Thermal Accelerometers, Heated-Plate Accelerometer, Heated-Gas Accelerometer, Gyroscopes, Piezoelectric Cables

Applications: Case studies in manufacturing industries, robotics

UNIT – IV

Flow Sensors: Pressure Gradient Technique, Thermal Transport, Ultrasonic, Electromagnetic, and Micro flow, Coriolis Mass Flow, Acoustic Sensors: Resistive Microphones, Fiber-Optic, Piezoelectric, Solid-State microphone, Light & Radiation Sensors: Photodiodes, Phototransistor, Photo resistors, Thermal detectors



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Chemical Sensors: Metal-Oxide Chemical, ChemFET, Electro-chemical, Potentiometric, Conduct metric, Amperometric, Optical Chemical, Mass Detector

Applications: Case studies in processing industries, oil and gas industries, water SCADA, pharmaceutical industries

UNIT – V

Introduction to wireless sensor networks, Challenges for wireless sensor networks, Applications for wireless sensor networks, enabling technologies for wireless sensor networks.

Single node architecture – Hardware components, Energy consumption of Sensor nodes (only Operation states with different power consumption, Relationship between computation and communication, Power consumption of sensor and actuators is included), Deployment environments

Sensor Network Architecture - Sensor Network Scenarios, Optimization goals and figures of merit, Design principles of WSN, Service interfaces of WSNs, Gateway-concepts.

TEXT BOOKS:

1. Measurement and Instrumentation Principles - Morris, AlanS
2. An Introduction to Error Analysis by John R.Taylor
3. Sensor Technology Handbook, John S.Wilson
4. Holger Karl & Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks" John-Wiley,First-Edition-2014.

REFERENCE BOOKS

1. Mechanical Measurements – Beckwith, Marangoni,Lienhard
2. Measurement of Systems - Application and design - Earnest O.Doeblin
3. Electronic Instrumentation and Measurement Technique - Albert DHelfrick
4. Kazem Sohraby, Daniel Minoli, &Taieb Znati, “Wireless Sensor Networks- Technology, Protocols, AndApplications”, John Wiley,2007.

Course Outcomes :The student will be able to

- Understand measuring parameters, measuring systems, effects ofenvironment, characteristics and parameters to be considered for designing aninstrument
- Understand different types of sensors/transducers, working principles,selection procedure, applications of sensingsystems
- Understand Challenges and applications of sensors and sensornetworks
- Select a sensor/sensing system for arequirement
- Test, install and collect the data from a group ofsensors.
- Derive sensor-based solution for differentapplications.



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IV Year - I Semester		L	T	P	C
		3	0	0	3
ADVANCED DIGITAL SIGNAL PROCESSING (Professional Elective 3)					

Course Objectives:

The main objectives of the course are

- To study about discrete time systems and to learn about FFT algorithms.
- To study the design techniques for FIR and IIR digital filters
- To study the finite word length effects in signal processing
- To study the properties of random signal, Multirate digital signal processing and about QMF filters

UNIT –I: Review of DFT, FFT, IIR Filters and FIR Filters: Introduction to filter structures (IIR & FIR). Implementation of Digital Filters, specifically 2nd Order Narrow Band Filter and 1st Order All Pass Filter. Frequency sampling structures of FIR, Lattice structures, Forward prediction error, Back ward prediction error, Reflection coefficients for lattice realization, Implementation of lattice structures for IIR filters, Advantages of lattice structures.

UNIT - II: Non-Parametric Methods: Estimation of spectra from finite duration observation of signals, Nonparametric Methods: Bartlett, Welch & Blackman-Tukey methods, Comparison of all Non-Parametric methods

UNIT – III: Parametric Methods: Autocorrelation & Its Properties, Relation between auto correlation & model parameters, AR Models – Yule-Walker & Burg Methods, MA & ARMA models for power spectrum estimation, Finite word length effect in IIR digital Filters – Finite word-length effects in FFT algorithms.

UNIT –IV: Multi Rate Signal Processing: Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Multistage Implementation of Sampling Rate Conversion, Filter design & Implementation for sampling rate conversion. Examples of up-sampling using an All Pass Filter.

UNIT –V: Applications of Multi Rate Signal Processing: Design of Phase Shifters, Interfacing of Digital Systems with Different Sampling Rates, Implementation of Narrow Band Low Pass Filters, Implementation of Digital Filter Banks, Sub-band Coding of Speech Signals, Quadrature Mirror Filters, Transmultiplexers, Over Sampling A/D and D/A Conversion.



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TEXT BOOKS:

1. J.G.Proakis & D. G. Manolakis, “Digital Signal Processing: Principles, Algorithms & Applications”, 4th Edition,PHI,2008.
2. Alan V Oppenheim & Ronald W Schaffer, “Discrete Time signal processing “, PHI. 2nd Edition,1999.
3. Emmanuel C. Ifeache, Barrie. W. Jervis, “DSP – A Practical Approach”, 2nd Edition, PearsonEducation,2000.

REFERENCE BOOKS:

1. S. M .Kay, “Modern spectral Estimation: Theory & Application “, 1988,PHI.
2. P.P.Vaidyanathan, “Multi Rate Systems and Filter Banks”, PearsonEducation.
3. Kaluri V. Rangarao, Ranjan K. Mallik, “Digital Signal Processing: A Practitioner’s Approach”, ISBN: 978-0-470-01769-2, 210 pages, November 2006 JohnWeley.
4. S.Salivahanan, A.Vallavaraj, C.Gnanapriya, “Digital Signal Processing”,2000,TMH

Course Outcomes:

On completion of the course, students will be able to:

- Comprehend the DFT, FFT and IIR filters.
- To study the modern digital signal processing algorithms and applications.
- Have an in-depth knowledge of use of digital systems in real time applications
- Acquire the basics of multi rate digital signal processing and apply the algorithms for wide area of recent applications.
- Analyze the power spectrum estimation and Comprehend the Finite word length effects in Fixed point DSP Systems.



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IV Year - I Semester	L	T	P	C
	3	0	0	3
AUGMENTED REALITY (Professional Elective 3)				

OBJECTIVE:

The course is designed to impart the fundamentals of augmented reality (AR), and teach how to build an AR experience.

UNIT – I:

Introduction to Augmented Reality: Definition and Scope, a brief history of Augmented Reality, Examples, Other related fields: Virtual Reality, Mixed Reality Continuum, Ubiquitous Computing.

Understanding Virtual Space: Defining visual space and content, defining position and orientation in three dimensions, navigation

UNIT – II:

Understanding human senses and their relationship to Output/Input Devices: The mechanics of sight – visual pathway, spatial vision and depth cues, The mechanics of hearing, mechanics of feeling, Multimodal displays, Visual perception, Requirements and Characteristics, Spatial display model, Visual displays

UNIT – III:

Sensors for tracking position, orientation and motion – Tracking, calibration and registration, coordinate systems, characteristics of tracking technology, Stationary tracking systems, Mobile sensors, optical tracking, sensor fusion, Computer vision for augmented reality – market tracking, multiple-camera infrared tracking, natural feature tracking by detection, incremental tracking, simultaneous localization and mapping, outdoortracking

Devices to enable navigation and interaction – 2D versus 3D interaction and navigation, the importance of a manual interface, hand and gesture tracking, whole body tracking, gaming and entertainment interfaces, navigating with mind.

UNIT – IV:

Software architectures – AR application requirements, software engineering requirements, Distributed object systems, dataflow, scene graphs, developer support.

Applications of Augmented and Virtual Reality: Gaming and Entertainment, Architecture and construction, Health and medicine, Aerospace and defence, education, information control and big data visualization, Tele-robotics and telepresence.

UNIT – V:

Human factors, legal and social considerations – human factor considerations, legal and social considerations, The future of AR – what may drive business cases, an AR developer’s wish list, taking AR outdoors, interfacing with smart objects, confluence of VR and AR, augmented humans, AR as dramatic medium, AR as social computing platform.



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TEXTBOOKS:

1. Augmented Reality – Principles and Practice, Dieter Schmalstieg and Tobias Höllerer, 1st Edition, Addison-Wesley
2. Practical Augmented Reality – A guide to the technologies, applications, and human factors for AR and VR, Steve Aukstakalnis, 1st Edition, Addison-Wesley
3. Understanding Augmented Reality, Concepts and Applications, Alan B. Craig, 1st Edition, Morgan Kaufman

REFERENCE BOOKS:

1. Handbook of Virtual Environments: Design, Implementation, and Applications, Kelly S. Hale and Kay M. Stanney, 2nd Edition, CRC Press
2. Designing Virtual Systems: The Structured Approach, Gerard Jounghyun Kim, Springer
3. Spatial Augmented Reality: Merging Real and Virtual Worlds, Oliver Bimber and Ramesh Raskar, 1st Edition, A K Peters/CRC press.

Course Outcomes:

At the end of the course, students will

- Understand the basics of Augmented Reality
- Understand human senses and their relationship to devices
- Understand various application scenarios of AR
- Understand software architecture



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IV Year - I Semester		L	T	P	C
		3	0	0	3
SOFTWARE RADIO (Professional Elective4)					

Pre-requisite(s): Basic knowledge of signal processing, concepts in wireless Communication and networks.

Course Objectives: This course enables the students to:

- Understand the basic components of software defined radio.
- Understand the distortion parameters and nonlinear Distortion in Transmitted Signals.
- Calculate power requirement in power amplifier for SDR.
- Understand Digital Pre-distortion Techniques for Linear/Nonlinear Distortion.
- Appraise Digital Pre-distortion Techniques.

UNIT 1: Basic components of software defined radios, Software defined radio architectures Part A, Software defined radio architectures- Part B.

UNIT 2: Distortion parameters, Sources and metrics of distortion in a transceiver, Nonlinear distortion and nonlinearity specifications, Power amplifiers: Nonlinear Distortion in Transmitted Signals.

UNIT 3: Power amplifier Line-up for linearity & power requirement calculations, Linearization Techniques for nonlinear distortion in SDR.

UNIT 4: Predistortion Techniques for nonlinear distortion in SDR.

UNIT 5: Digital Predistortion Techniques for Linear/Nonlinear Distortion.

Textbook:

1. Jeffrey H. Reed “Software Radio: A Modern Approach to radio Engineering”, Pearson Education Asia, 2002

References:

1. Sanjay Kumar, “Wireless Communication the Fundamental and Advanced Concepts” River Publishers, Denmark, 2015 (Indian reprint)
2. https://onlinecourses.nptel.ac.in/noc18_ec01/preview.

Course Outcomes: After the completion of this course, students will be to:

- Able to analyze the basic components of software defined radio.
- Demonstrate understanding about distortion parameters and nonlinear Distortion in Transmitted Signals
- Able to calculate power requirement in power amplifier for SDR
- Demonstrate understanding about Digital Pre-distortion Techniques for Linear/Nonlinear Distortion
- Design and analyze the various algorithms used for software defined radio.



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IV Year - I Semester		L	T	P	C
		3	0	0	3
LOW POWER VLSI DESIGN (Professional Elective 4)					

Course Objectives:

- Known the low power low voltage VLSI design
- Understand the impact of power on system performances.
- Known about different Design approaches.
- Identify suitable techniques to reduce power dissipation in combinational and sequential circuits.

UNIT –I:

Fundamentals: Need for Low Power Circuit Design, Sources of Power Dissipation – Switching Power Dissipation, Short Circuit Power Dissipation, Leakage Power Dissipation, Glitching Power Dissipation, Short Channel Effects – Drain Induced Barrier Lowering and Punch Through, Surface Scattering, Velocity Saturation, Impact Ionization, Hot Electron Effect.

UNIT –II:

Supply Voltage Scaling for Low Power: Device Feature Size Scaling, Constant-Field Scaling, Constant-Voltage Scaling, Architectural-Level Approaches: Parallelism for Low Power, Pipelining for Low Power, Combining Parallelism with Pipelining, Voltage Scaling Using High-Level Transformations: Multilevel Voltage Scaling Challenges in MVS Voltage Scaling Interfaces, Static Timing Analysis Dynamic Voltage and Frequency Scaling

UNIT -III

Low-Power Design Approaches: Low-Power Design through Voltage Scaling – VTCMOS circuits, MTCMOS circuits, Architectural Level Approach – Pipelining and Parallel Processing Approaches. Power Gating, Clock Gating Versus Power Gating, Power-Gating Issues, Isolation Strategy, State Retention Strategy, Power-Gating Controller, Power Management, Combining DVFS and Power Management.

UNIT –IV:

Low-Voltage Low-Power Adders: Introduction, Standard Adder Cells, CMOS Adder's Architectures – Ripple Carry Adders, Carry Look-Ahead Adders, Carry Select Adders, Carry Save Adders, Low-Voltage Low-Power Design Techniques – Trends of Technology and Power Supply Voltage.

Low-Voltage Low-Power Multipliers: Introduction, Overview of Multiplication, Types of Multiplier Architectures, Braun Multiplier, Baugh-Wooley Multiplier, Introduction to Wallace Tree Multiplier.



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UNIT –V:

Low-Voltage Low-Power Memories: Basics of ROM, Low-Power ROM Technology, Future Trend and Development of ROMs, Basics of SRAM, Memory Cell, Pre-charge and Equalization Circuit, Low-Power SRAM Technologies, Basics of DRAM, Self-Refresh Circuit, Future Trend and Development of DRAM.

TEXT BOOKS:

1. CMOS Digital Integrated Circuits – Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 2011.
2. Low-Voltage, Low-Power VLSI Subsystems – Kiat-Seng Yeo, Kaushik Roy, TMH Professional Engineering, 1st edition, 2004

REFERENCE BOOKS:

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011
2. Low Power CMOS VLSI Circuit Design – Kaushik Roy, Sharat C. Prasad, John Wiley & Sons, 2000.
3. Practical Low Power Digital VLSI Design – Gary K. Yeap, Kluwer Academic Press, 2002.
4. Leakage in Nanometer CMOS Technologies – Siva G. Narendran, Anatha Chandrakasan, Springer, 2005.

Course Outcomes:

Upon completing this course, the student will be able to

- Understand the need of Low power circuit design.
- Attain the knowledge of architectural approaches.
- Analyze and design Low-Voltage Low-Power combinational circuits.
- Known the design of Low-Voltage Low-Power Memories



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IV Year - I Semester		L	T	P	C
		3	0	0	3
EMBEDDED SYSTEMS (Professional Elective 4)					

Course Objectives:

The main objectives of this course are given below:

- The basic concepts of an embedded system are introduced.
- The various elements of embedded hardware and their design principles are explained.
- Different steps involved in the design and development of firmware for embedded systems is elaborated.
- Internals of Real-Time operating system and the fundamentals of RTOS based embedded firmware design is discussed.
- Fundamental issues in hardware software co-design were presented and explained.
- Familiarize with the different IDEs for firmware development for different family of processors/controllers and embedded operating systems.
- Embedded system implementation and testing tools are introduced and discussed.

UNIT-I

INTRODUCTION: Embedded system-Definition, history of embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems, the typical embedded system-core of the embedded system, Memory, Sensors and Actuators, Communication Interface, Embedded firmware, Characteristics of an embedded system, Quality attributes of embedded systems, Application-specific and Domain-Specific examples of an embedded system.

UNIT-II

EMBEDDED HARDWARE DESIGN: Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock.

UNIT-III

EMBEDDED FIRMWARE DESIGN: Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

UNIT-IV

REAL TIME OPERATING SYSTEM: Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling, Task communication, Task synchronization.



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HARDWARE SOFTWARE CO-DESIGN: Fundamental Issues in Hardware Software Co-Design, Computational models in embedded design, Hardware software Trade-offs, Integration of Hardware and Firmware.

UNIT-V:

EMBEDDED SYSTEM DEVELOPMENT, IMPLEMENTATION AND TESTING: The integrated development environment, Types of files generated on cross-compilation, Deassembler/Decompiler, Simulators, Emulators and Debugging, Target hardware debugging, Embedded Software development process and tools, Interpreters, Compilers and Linkers, Debugging tools, Quality assurance and testing of the design, Testing on host machine, Simulators, Laboratory Tools.

Text Books:

1. Embedded Systems Architecture- By Tammy Noergaard, Elsevier Publications, 2013.
2. Embedded Systems-By Shibu. K.V-Tata McGraw Hill Education Private Limited, 2013.

References:

1. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications, 2013.
2. Embedded Systems-Lyla B.Das-Pearson Publications, 2013.

Course Outcomes:

At the end of this course the student can able to:

- Understand the basic concepts of an embedded system and able to know an embedded system design approach to perform a specific function.
- The hardware components required for an embedded system and the design approach of an embedded hardware.
- The various embedded firmware design approaches on embedded environment.
- Understand how to integrate hardware and firmware of an embedded system using real time operating system.



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IV Year - I Semester		L	T	P	C
		3	0	0	3
DSP PROCESSORS and ARCHITECTURES (Professional Elective 4)					

Course Objectives:

- To recall the various techniques of digital signal processing.
- To introduce the architectural features of programmable DSP Processors of Texas Instruments (TI) and Analog devices (AD).
- To understanding the practical examples of DSP Processor architectures.
- To develop programming knowledge by using Instruction set of DSP Processors.
- To know the interfacing techniques to I/O devices and memory.

UNIT-I:**Introduction to Digital Signal Processing**

Introduction, a Digital signal-processing system, the sampling process, discrete time sequences, Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation.

Computational Accuracy in DSP Implementations

Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT-II:**Architectures for Programmable DSP Devices**

Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation UNIT, Programmability and Program Execution, Speed Issues, Features for External interfacing.

UNIT-III:**Programmable Digital Signal Processors**

Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX Instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX Processors, Pipeline Operation of TMS320C54XX Processors.

UNIT-IV:**Analog Devices Family of DSP Devices**

Analog Devices Family of DSP Devices – ALU and MAC block diagram, Shifter Instruction, Base Architecture of ADSP 2100, ADSP-2181 high performance Processor.

Introduction to Black fin Processor - The Black fin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals



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UNIT-V:

Interfacing Memory and I/O Peripherals to Programmable DSP Devices

Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).

TEXT BOOKS:

1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. A Practical Approach To Digital Signal Processing - K Padmanabhan, R. Vijayarajeswaran, Ananthi. S, New Age International, 2006/2009
3. Embedded Signal Processing with the Micro Signal Architecture: Woon-Seng Gan, Sen M. Kuo, Wiley-IEEE Press, 2007

REFERENCE BOOKS:

1. Digital Signal Processors, Architecture, Prog and Applications-B. Venkataramani and M. Bhaskar, 2002, TMH.
2. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. 2000, S. Chand & Co.
3. Digital Signal Processing App Using the ADSP-2100 Family by The Applications Engineering Staff of Analog Devices, DSP Division, Edited by Amy Mar, PHI
4. The Scientist and Engineer's Guide to Digital Signal Processing by Steven W. Smith, Ph.D., California Technical Publishing, ISBN 0-9660176-3-3, 1997.

Course Outcomes:

Upon the completion of course, student able to

- Understand the basic concepts of Digital Signal Processing.
- To differentiate the architectural features of General purpose processors and DSP processors.
- Understand the architectures of TMS320C54xx devices and ADSP 2100 DSP devices.
- Write the simple assembly language programs by using instruction set of TMS320C54xx.
- To interface the various devices to DSP Processors.



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IV Year - I Semester		L	T	P	C
		3	0	0	3
MULTI MEDIA COMMUNICATION (Professional Elective 4)					

Course objectives: This course will enable students to

- Define the Multimedia Communication Models
- Explain Multimedia Transport in Wireless Networks
- Solve the Security issues in multimedia networks
- Illustrate real-time multimedia network applications.
- Explain different network layer based application.

Unit-I: Introduction and tools used for MM content development , Media interaction, bimodality of human speech, Lip reading, speech driven talking heads, Lip synchronization, Lip tracking, Audio to visual mapping.

Unit-II: Biomodal person verification, Joint AV coding, Multimedia processing, Digital media, Signal processing elements, Challenges in MM processing, Perceptual coding of Digital Audio.

Unit-III: Transform audio coders, Image coding, video coding, Water marking techniques, Organization, Storage and retrieval, ANNs for MMSP.

Unit-IV: Distributed MM systems, Multimedia processors, Multimedia OS, Multimedia communication standards, MPEG-1, MPEG-2, MPEG-4, MPEG-7.

Unit-V: Real time multimedia across Internet, packet audio/video multimedia transport across IP/ATM Network, Wireless multimedia, mobile multimedia access for internet, multimedia PCS.

Text Book:

1. Multimedia Communication Systems: Techniques and Standards, KR RAO et al, Pearson, 2002.
2. Insight into Mobile Multimedia Communication : D. BULL et al, Academic Press, 1999
3. Multimedia Systems Design : PK ANDLEIGH , K. THAKKAR, PHI, 2002
4. Multimedia, TAY VAUGHAN, 5/e, TMH, 2001

Course Outcomes:

- Develop the multimedia content using multimedia tools
- Understand various audio, video and joint coding techniques.
- Identify the requirements of real time multimedia transfer on IP networks.
- Study different types of multimedia processors



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IV Year - I Semester	L	T	P	C
	0	0	3	1.5
INTERNET OF THINGS LAB				

List of Experiments:

1. Introduction to Raspberry Pi Board/ Arduino/NodeMCU.
2. Familiarization with ARM keil MDK for programming and debugging an application on the PSoC 4 BLE chip and perform necessary software installation.
3. To interface Push button/Digital sensor (IR/LDR) with ARM keil MDK on PSoC 4 BLE chip and write a program to turn ON LED when push button is pressed or at sensor detection.
4. Set up a Bluetooth Low Energy (namely Bluetooth Smart) connection between the PSoC BLE kit and a smart phone and use an app to send and receive data to and from the BLE Pioneerkit.
5. To interface capacitor sensor (touch sensor) with smart phone and write a program to turn RGB LED ON/OFF when '1'/'0' is received from smart phone using Bluetooth.
6. Automatic street light control to control the street light (Turn on and off based on the light) using Arduino/ Node MCU/RaspberryPi
7. Smoke Detection using MQ-2 GasSensor
8. Detecting obstacle with IR Sensor and Arduino/ Node MCU/RaspberryPi
9. Arduino board interfacing with the temperature and humidity sensor and prints the output on LCD / serial monitor
10. Write an Arduino program for interfacing Arduino board with the Ultrasonic sound sensor and print the output on Serial monitor.

Equipment required for Laboratories:

Arduino/Node MCU/Raspberry Pi + PSoC 4 BLE Bluetooth Low Energy Pioneer Kit + Hardware, MQ-2 Gas Sensor, Ultrasonic sound sensor.



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IV Year - I Semester		L	T	P	C
		0	0	3	1.5
MICROWAVE AND OPTICAL COMMUNICATION ENGINEERING LAB					

Minimum Twelve Experiments to be conducted:

Part-A (Any 7 Experiments (8 & 9 Compulsory))

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Attenuation Measurement.
4. Directional Coupler Characteristics.
5. Impedance and Frequency Measurement.
6. Scattering parameters of Circulator.
7. Scattering parameters of Magic Tee.
8. Radiation Pattern of Horn and Parabolic Antennas.
9. Synthesis of Microstrip antennas (Rectangular Structure) Using any Industry standard Simulation Software.

Part – B (Any 5 Experiments) :

10. Characterization of LED.
11. Characterization of Laser Diode.
12. Intensity modulation of Laser output through an optical fiber.
13. Measurement of Data rate for Digital Optical link.
14. Measurement of NA.
15. Measurement of losses for Analog Optical link.

Equipment required for Laboratories:

1. Regulated Klystron Power Supply, Klystron mount
2. VSWR Meter
3. Micro Ammeter
4. Multimeter
5. CRO
6. GUNN Power Supply, Pin Modulator
7. Crystal Diode detector
8. Micro wave components (Attenuation)
9. Frequency Meter
10. Slotted line carriage
11. Probe detector
12. Wave guide shorts
13. SSTuner
14. Directional Coupler
15. E, H, Magic Tees
16. Circulators, Isolator
17. Matched Loads



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18. Pyramidal Horn and Parabolic Antennas
19. Turntable for Antenna Measurements
20. Fiber Optic Analog Trainer based LED
21. Fiber Optic Analog & Trainer based laser
22. Fiber Optic Trainer
23. Fiber cables - (Plastic, Glass)



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IV Year - II Semester		L	T	P	C
		3	0	0	3
WIRELESS COMMUNICATION (Professional Elective 5)					

Course Objectives:

The student will be introduced to:

- The Aim of this course is to introduce the fundamental technologies for wireless Communication and networking
- Introducing the concepts of Multiple Access Schemes
- Introducing the comprehensive exposure to the fast-evolving high-tech fields of Wireless communications
- It introduces the latest technologies such as CDMA, OFDM, and MIMO, which form the bedrock of 3G/4G wireless networks

UNIT I

Introduction to 3G/4G Wireless Communications: Introduction, 2G Wireless Standards, 3G Wireless Standards, 4G Wireless Standards, Overview of Cellular Service Progression Principles of Wireless Communications: The Wireless Communication Environment, Modeling of Wireless Systems, System Model for Narrowband Signals, Rayleigh Fading Wireless Channel, BER Performance of Wireless Systems: SNR in a Wireless System, BER in Wireless Communication System, Rayleigh BER at High SNR. Intuition for BER in a Fading Channel. Channel Estimation in Wireless Systems, Diversity in Wireless Communication.

UNIT II

Code Division for Multiple Access (CDMA): Introduction to CDMA, Basic CDMA Mechanism, Fundamentals of CDMA Codes, Spreading Codes based on Pseudo-Noise (PN) Sequences, Correlation Properties of Random CDMA Spreading Sequences, Multi-User CDMA, Advantages of CDMA.

UNIT III

Multiple-Input Multiple-Output Wireless Communications: Introduction to MIMO Wireless Communications, MIMO System Model, MIMO Zero-forcing (ZF) Receiver, MIMO MMSE Receiver, Singular Value Decomposition (SVD) of the MIMO Channel, Singular Value Decomposition (SVD) and MIMO Capacity

UNIT IV

Orthogonal Frequency-Division Multiplexing: Introduction, Motivation and Multicarrier Basics, OFDM Example, Bit-Error Rate (BER) for OFDM, MIMO-OFDM, Effect of Frequency Offset in OFDM, OFDM – Peak-to-Average Power Ratio (PAPR), SC-FDMA.

UNIT V

Satellite-Based Wireless Systems: Introduction, Satellite Orbits, Use of Satellites for Communication, Satellites and Transponders, Signal and Noise Calculations, Systems



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Using Geostationary Satellites, Systems Using Low-Earth-Orbit Satellites, Systems Using Medium Earth-Orbit Satellites.

TEXTBOOKS:

1. Principles of Modern Wireless Communication Systems – Aditya K Jagannathan, McGraw Hill publishers, 2017
2. Wireless Communication Technology – Blake, Delmar/Cengage Learning India, first Edition, 2012

REFERENCES:

1. Wireless Communications and Networking – Vijay K. Garg, Morgan Kaufmann, 2007

Course Outcomes:

After going through this course, the student will be able to

- Know about the Wireless systems and Standards (1G/2G/3G systems).
- Concept and analysis of CDMA-based wireless networks.
- Understand the concepts of Multiple-Input Multiple-Output (MIMO).
- Understand the modern wireless systems using OFDM.
- Analysis of Satellite-Based Wireless systems.



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IV Year - II Semester		L	T	P	C
		3	0	0	3
VLSI TESTING & TESTABILITY (Professional Elective 5)					

Course Objectives:

- To impart knowledge on the basic faults that occur in digital systems
- To describe fault detection techniques in combinational circuits.
- To outline procedures to generate test patterns for detecting single stuck faults in combinational and sequential circuits.
- To explain design for testability techniques with improved fault coverage.
- To introduce BIST concepts and specific architectures.
- To give exposure to approaches for introducing BIST into logic circuits, memories and embedded cores.

UNIT I

Introduction to Test and Design for Testability (DFT) Fundamentals Modelling: Modelling digital circuits at logic level, register level and structural models, Levels of modelling. Logic Simulation: Types of simulation, Delay models, Element evaluation, Hazard detection, Gate level event driven simulation.

UNIT II

Fault Modelling – Logic fault models, Fault detection and redundancy, Fault equivalence and fault location. Single stuck and multiple stuck – Fault models. Fault simulation applications, General techniques for Combinational circuits.

UNIT III

Testing for single stuck faults (SSF), Automated test pattern generation (ATPG/ATG) for SSFs in combinational and sequential circuits, Functional testing with specific fault models, Vector simulation – ATPG vectors, formats, Compaction and compression, Selecting ATPG Tool.

UNIT IV

Design for testability – testability trade-offs, techniques. Scan architectures and testing – controllability and Observability generic boundary scan, full integrated scan, storage cells for scan design. Board level and system level DFT approaches. Boundary scan standards. Compression techniques – different techniques, syndrome test and signature analysis

UNIT V

Built-in self-test (BIST): BIST Concepts and test pattern generation. Specific BIST Architectures – CSBL, BEST, RTS, LOCST, STUMPS, CBIST, CEBS, RTD, SST, CATS, CSTP, BILBO, Brief ideas on some advanced BIST concepts and design for self-test at board level. Memory BIST (MBIST): Memory test architectures and techniques – Introduction to memory test, Types of memories and integration, Embedded memory testing model. Memory test requirements for MBIST, Brief ideas on embedded core testing



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TEXT BOOKS:

1. Miron Abramovici, Melvin A. Breur, Arthur D. Friedman, Digital Systems Testing and Testable Design, Jaico Publishing House, 2001.
2. Alfred Crouch., Design for Test for Digital ICs & Embedded Core Systems, Prentice Hall.

REFERENCES:

1. Robert J. Feugate, Jr., Steven M. Mentyn, Introduction to VLSI Testing, Prentice Hall, Englehood Cliffs, 1998.
2. Bushnell, M., and Agrawal, Vishwani D, Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits, Kluwer Academic Publishers, 2002

Course Outcomes:

- Model digital circuits at logic and RTL levels
- Simulate digital ICs in the presence of faults and evaluate the given test set for fault coverage
- Generate test patterns for detecting single stuck faults in combinational and sequential circuits
- Identify schemes for introducing testability into digital circuits with improved fault coverage
- Compare different approaches for introducing BIST into logic circuits, memories and embedded cores



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IV Year - II Semester		L	T	P	C
		3	0	0	3
MACHINE LEARNING & ARTIFICIAL INTELLIGENCE (Professional Elective 5)					

OBJECTIVE:

To familiarize students with basic concepts, theories and advancements in ML and AI and help them in understanding the mathematics behind algorithms and apply them in real world scenarios

UNIT – I

Introduction to ML/AI - AI Foundation, history of AI, latest advancements and applications
 Machine Learning – I: Linear Regression - Learn to implement linear regression and predict continuous data values, Clustering - Learn how to create segments based on similarities using K-Means and Hierarchical clustering

UNIT – II

Machine Learning – II: Naïve Bayes and Logistic regression - Understand how supervised learning is used for classification, Support vector machines - Learn to classify data points using support vectors, decision trees - Tree-based model that is simple and easy to use. Learn the fundamentals on how to implement them

Natural Language Processing: Basics of text processing, lexical processing - Learn to extract features from unstructured text and build machine learning models on text data, syntax and semantics - Conduct sentiment analysis, learn to parse English sentences and extract meaning from them

UNIT – III

Deep learning & Neural Networks: Information flow in neural networks - Understand the components and structure of artificial neural networks, Training a neural network - Learn the latest techniques used to train highly complex neural networks, Convolutional neural networks - Use CNN's to solve complex image classification problems, Recurrent neural networks - Study LSTMs and RNN's applications in text analytics, Creating and deploying networks using TensorFlow and Keras (Deep Learning Library) - Build and deploy your own deep neural networks on a website, learn to use Tensor Flow API and Keras.

UNIT – IV

Graphical Models: Introduction to Bayesian methods, Graphical models - Study probabilistic way of modelling systems - Markov properties, Factor Graphs and Bayesian belief networks, Learning and Inference - Learn how graphics models are used for supervised and unsupervised learning



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UNIT – V

Reinforcement Learning: Introduction to RL, understand how machines can be programmed to learn by themselves, Exact methods - Learn the math behind Exact Statistics - Dynamic Programming, Monte Carlo methods, Temporal Difference Learning, Approximate Methods - Learn policy gradient methods and their applications in learning

TEXTBOOKS:

1. Machine Learning, by Tom M Mitchell, Indian Edition, McGraw Hill, first Edition 2017.
2. Deep Learning by Goodfellow, Bengio, Courville. The MIT Press, 2016
3. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill, 3rd Edition 2008.

REFERENCE BOOKS

1. Understanding Machine Learning: From Theory to Algorithms, by Shai Shalev-Shwartz and Shai Ben-David, 1st Edition, Cambridge University Press, 2014.
2. Artificial Intelligence - A Modern Approach by Stuart Russell & Peter Norvig, Prentice Hall, 3rd Edition, 2009.

Course Outcomes:

The student should be able to:

- Understand machine learning concepts and range of problems that can be handled by machine learning.
- Apply the machine learning concepts in real life problems.
- Understand artificial neural networks concept and apply techniques to train the neural networks
- Understand how graphical models are used for supervised and unsupervised learning
- Understand Reinforcement Learning concept and applications
- Modify the algorithms based on need



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IV Year - II Semester		L	T	P	C
		3	0	0	3
SPEECH PROCESSING (Professional Elective 5)					

Course Objectives:

The main objectives of the course are as follows:

- Understand the mechanism of human speech production and articulation
- Understand time and frequency domain methods of speech processing
- Understand linear predictive analysis for speech signals and LPC
- Study the algorithms and models involved for speaker and speech recognition systems

Unit I**Mechanics of speech**

Speech production: Mechanism of speech production, Acoustic phonetics, The Acoustic Theory of Speech Production: Uniform lossless tube, Effects of losses in the vocal tract, Digital models for speech signals: Vocal tract, Radiation, Excitation, Auditory perception: psycho acoustics. Representations of speech waveform: Sampling of speech signals, Quantization.

Unit II**Time and frequency domain methods for speech processing**

Time domain parameters of Speech signal: Short-Time Energy, Average Magnitude, Average Zero crossing Rate, Silence Discrimination using ZCR and energy, Short Time Auto Correlation Function, Pitch period estimation using Auto Correlation Function.
 Short Time Fourier analysis: Fourier transform and linear filtering interpretations, Sampling rates in time and frequency, Pitch detection, Analysis by Synthesis, Analysis synthesis systems: Phase vocoder, Channel Vocoder, Median Smoothing, Spectrographic displays

Unit III**Linear predictive analysis of speech**

Basic Principles of linear predictive analysis: Auto correlation method, Covariance method, Solution of LPC equations: Cholesky method, Durbin's Recursive algorithm, Application of LPC parameters: Pitch detection using LPC parameters, Formant analysis using LPC parameters, VELP. Relations Between the Various Speech Parameters, CELP.

Unit IV**Application of speech processing**

Voice response systems: General considerations in the design of voice response systems, A multiple output digital voice response system, Speaker recognition systems: Speaker verification system, Speaker identification system.

UNIT V

Speech recognition systems: Isolated digit recognition system, Continuous digit recognition system. Typical applications of computer voice response systems: Wiring communication equipment, Information retrieval systems



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Text books:

1. L. R. Rabiner and R. W. Schaffer, Digital Processing of Speech signals, Prentice Hall, 2004
2. Ben Gold and Nelson Morgan, Speech and Audio Signal Processing, John Wiley and Sons Inc., Singapore, 2004

References:

1. Quatieri, Discrete-time Speech Signal Processing, Prentice Hall, 2001
2. L.R. Rabiner and B. H. Juang, Fundamentals of speech recognition, Prentice Hall, 1999.

Course Outcomes:

At the end of this course the student will be able to:

- Summarize the mechanism of human speech production and articulation
- Identify the time domain speech signal parameters
- Differentiate time and frequency domain methods of speech processing
- Attribute linear predictive analysis for speech signals
- Explain the solutions for LPC equations
- Implement the different algorithms and models involved for speaker and speech recognition systems



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IV Year - II Semester		L	T	P	C
		3	0	0	3
INDUSTRIAL INTERNET OF THINGS (PROFESSIONAL ELECTIVE-5)					

Course Objectives:

The main objectives of this course are:

- Learn and understand the Importance of IoT in industrial applications
- Know how IoT has become a game changer in the new economy where the customers are looking for integrated value.
- Apply the IoT concepts in building solutions to Industrial problems
- Learn and understand the tools and techniques that enable IoT solution and Security aspects.

UNIT-I

INTRODUCTION: Introduction to IoT, IoT Vs. IIoT, History of IIoT, Components of IIoT - Sensors, Interface, Networks, People & Process, Hype cycle, IOT Market, Trends & future Real life examples, Key terms of IoT– IoT Platform, Interfaces, API, clouds, Data Management Analytics, Mining & Manipulation; Role of IIoT in Manufacturing Processes Use of IIoT in plant maintenance practices, Sustainability through Business excellence tools Challenges and Benefits in implementing IIoT.

UNIT-II

ARCHITECTURES: Overview of IoT components, Various Architectures of IoT and IIoT, Advantages & disadvantages, Industrial Internet - Reference Architecture; IIoT System components: Sensors, Gateways, Routers, Modem, Cloud brokers, servers and its integration, WSN, WSN network design for IoT.

SENSORS AND INTERFACING: Introduction to sensors, Transducers, Classification, Roles of sensors in IIoT, Various types of sensors, Design of sensors, sensor architecture, special requirements for IIoT sensors, Role of actuators, types of actuators. Hardwire the sensors with different protocols such as HART, MODBUS-Serial & Parallel, Ethernet, BACnet, Current, M2M etc.

UNIT-III

PROTOCOLS AND CLOUD: Need of protocols; Types of Protocols, Wi-Fi, Wi-Fi direct, Zigbee, Z wave, BACnet, BLE, Modbus, SPI, I2C, IIoT protocols –COAP, MQTT, 6LoWPAN, LWM2M, AMPQ IIoT cloud platforms: Overview of COTS cloud platforms, Predix, PTC ThingWorx, Microsoft Azure etc. Data analytics, cloud services, Business models: SaaS, PaaS, IaaS.

UNIT-IV

SECURITY: Introduction to web security, Conventional web technology and relationship with IIoT, Vulnerabilities of IoT, Privacy, Security requirements, Threat analysis, Trust, IoT security tomography and layered attacker model, Identity establishment, Access control, Message



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integrity, Non-repudiation and availability, Security model for IoT, Network security techniques Management aspects of cyber security.

ANALYTICS: IoT Analytics: Role of Analytics in IoT, Data visualization Techniques.

UNIT-V

DIGITAL TWIN: Introduction to Digital Twin, need for Digital Twin, Elements of Digital Twin, Digital Twin process design and information requirements, Digital twin conceptual architecture - create, communicate, Aggregate, Analyze, Insight, Act, driving business value through digital twin.

DIGITAL TWIN FOR ASSET: Digitalizing asset behaviour using simulated mathematical modelling and building Digital Twin - Need, Benefits, Architecture, Models and Use cases - Predictive and Prescriptive maintenance.

TEXT BOOKS:

1. Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications, by Daniel Minoli, Bernd Scholz-Reiter, Florian, Willy Publication
2. Digital Twin Technologies and Smart Cities by Farsi, M., Daneshkhah, A., Hosseinian-Far, A., Jahankhani, H., Springer International Publishing, 2020.
3. Architecting the Internet of Things, by Michahelles, Springer, 2011

REFERENCES:

1. The Internet of Things Connecting Objects to the Web” by Hakima Chaouchi, Willy Publications
2. The Internet of Things: Key Applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi, 2nd Edition, Willy Publications
3. Inside the Internet of Things (IoT), Deloitte University Press
4. Internet of Things- From Research and Innovation to Market Deployment; By Ovidiu & Peter; River Publishers Series
5. Five thoughts from the Father of the Internet of Things; by Phil Wainewright - Kevin Ashton
6. How Protocol Conversion Addresses IIoT Challenges: White Paper By RedLion.
7. <https://www.ge.com/digital/applications/digital-twin>
8. <https://www2.deloitte.com/us/en/insights/focus/industry-4-0/digital-twin-technology-smart-factory.html>

Course Outcomes:

At the end of this course the student will be able to:

- Understand the elements of IoT to build a total control plane in an Industrial application
- Apply M2M protocols for development of IoT Applications.
- Learn and understand the concept of digitalization and data acquisition.
- Build smart factory based on the IoT concepts
- Build Industrial Digital Twins.



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

IV Year - II Semester		L	T	P	C
		3	0	0	3
3D PRINTING Open Elective (OE2)					

Course Objectives:

The main objectives of this course are:

- The course aims at the importance of Additive Manufacturing, classifications, models, specifications of various Additive Manufacturing Techniques.
- Principles and operation of 3Dp, Various types of 3DP
- Techniques of printing electronics
- To learn the data formats and soft-wares required
- The applications of RP

UNIT-I

Introduction to Prototyping, Traditional Prototyping Vs Rapid Prototyping (RP), Need for time compression in product development, Distinction between RP and CNC and other related technologies, Classification of RP, commonly used terms, advantages and limitations of rapid prototyping.

UNIT-II

Three-Dimensional Printing (3DP)

Overview of 3DP, 3D Printer, 3D Systems, and Z Corporation, ExOne - Metal and Molding Sand Printer, Metal Line: Direct Metal Printer, Molding Sand Line: Direct Core and Mold-Making Machine, Soligen - Direct Shell Production Casting (DSPC), Voxel jet- 3D Printing System, Optomec - Maskless Mesoscale Material Deposition (M3D),

UNIT-III

Techniques for printing electronics, printing electronics, 2D-printing technologies- Flexographic, Offset, Gravure, screen printing, Processes in 3D-printing electronics - Improved building process for 3D devices, Fictionalization of 3D surfaces, Current trends in 3D-printed electronics- antennas, flexible electronics, batteries, The market for 3D-printed electronics And integrated machines

UNIT – IV

RAPID PROTOTYPING DATA FORMATS: STL Format, STL File Problems, consequence of building valid and invalid tessellated models, STL file Repairs: Generic Solution, other Translators, Newly Proposed Formats.



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RAPID PROTOTYPING SOFTWARE'S: Features of various RP software's like Magics, Mimics, Solid View, View Expert, 3 D View, Velocity 2, STL View 3 Data Expert and 3 D doctor.

UNIT –V

RP APPLICATIONS: Application in engineering, analysis and planning, aerospace industry, automotive industry, jewelry industry, coin industry, GIS application, arts and architecture. RP medical and bioengineering applications: planning and simulation of complex surgery, customized implants & prosthesis, design and production of medical devices, forensic science and anthropology, visualization of bimolecular.

TEXT BOOKS:

1. Chua Chee Kai., Leong Kah Fai., Chu Sing Lim, Rapid Prototyping: Principles and Applications in Manufacturing, World Scientific,2010.
2. Andreas Gebhardt Jan-Steffen Hotter, Additive Manufacturing: 3D Printing for prototyping and Manufacturing, Hanser Publications, 6915 Valley Avenue, Cincinnati, Ohio.
3. Ian Gibson., David W Rosen., Brent Stucker, Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Springer,2010.

REFERENCE BOOKS:

1. Rapid Manufacturing / D.T. Pham and S.S.Dimov/Springer
2. Wohlers Report 2000 /Terry T Wohlers/WohlersAssociates
3. Rapid Prototyping & Manufacturing / Paul F.Jacobs/ASMEPress
4. Rapid Prototyping / Chua&Liou

Course Outcomes:

At the end of this course the student will be able to:

- Identify the importance of RP in presentscenario.
- Gain the knowledge on3DP
- Application of 3DP in electronics.
- Minimize various errors that are occurring during conversion of CADmodels.
- Applications ofRP.



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IV Year - II Semester		L	T	P	C
		3	0	0	3
BLOCKCHAIN TECHNOLOGY Open Elective (OE2)					

Course Objectives:

The main objectives of this course are:

- Understand how block chain systems (mainly Bit coin and Ethereum) work and to securely interact with them,
- Design, build, and deploy smart contracts and distributed applications,
- Integrate ideas from block chain technology into their own projects.

Unit I:

Introduction: Scenarios, Challenges Articulated, Blockchain, Blockchain Characteristics, Opportunities Using Blockchain, History of Blockchain.

Evolution of Blockchain: Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Blockchain Evolution, Consortia, Forks, Public Blockchain Environments, Type of Players in Blockchain Ecosystem, Players in Market.

Unit II:

Blockchain Concepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on blockchain, data storage on blockchain, wallets, coding on blockchain: smart contracts, peer-to-peer network, types of blockchain nodes, risk associated with blockchain solutions, life cycle of blockchain transaction.

Unit III:

Architecting Blockchain solutions: Introduction, Obstacles for Use of Blockchain, Blockchain Relevance Evaluation Framework, Blockchain Solutions Reference Architecture, Types of Blockchain Applications, Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Blockchain Solutions, Architecture Considerations, Architecture with Blockchain Platforms, Approach for Designing Blockchain Applications.

Unit IV:

Ethereum Blockchain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, MyEtherWallet, Ethereum Networks/Environments, Infura, Etherscan, Ethereum Clients, Decentralized Application, Metamask, Tuna Fish Use Case Implementation, OpenZeppelin Contracts



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Unit V:

Hyperledger Blockchain Implementation: Introduction, Use Case – Car Ownership Tracking, Hyperledger Fabric, Hyperledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chaincode Functions Using Client Application.

Advanced Concepts in Blockchain: Introduction, InterPlanetary File System (IPFS), Zero-Knowledge Proofs, Oracles, Self-Sovereign Identity, Blockchain with IoT and AI/ML Quantum Computing and Blockchain, Initial Coin Offering, Blockchain Cloud Offerings, Blockchain and its Future Potential.

TEXT BOOKS:

- 1) “Blockchain for Enterprise Application Developers”, Ambadas, Arshad SarfarzAriff, Sham - Wiley
- 2) “Mastering Bitcoin: Programming the Open Blockchain”, Andreas M. Antonopoulos, O’Reilly

REFERENCES:

- 1) Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Bambara, Paul R. Allen, Mc GrawHill.
- 2) Blockchain: Blueprint for a New Economy, Melanie Swan, O’Reilly

E-RESOURCES:

<https://github.com/blockchainedindia/resources>

Course Outcomes:

At the end of this course the student will be able to:

- Demonstrate the foundation of the Block chain technology and understand the processes in payment and funding.
- Identify the risks involved in building Block chain applications.
- Review of legal implications using smart contracts.
- Choose the present landscape of Blockchain implementations and Understand Cryptocurrency markets
- Examine how to profit from trading cryptocurrencies.



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IV Year - II Semester		L	T	P	C
		3	0	0	3
CYBER SECURITY & CRYPTOGRAPHY Open Elective (OE2)					

Course Objectives:

- Able to identify security risks and take preventive steps
- To understand the forensics fundamentals.
- To understand the evidence capturing process.
- To understand the preservation of digital evidence.

Unit I : Introduction to Cybercrime: Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Cybercriminals, Classifications of Cybercrime, Cyberstalking, Cybercafe and Cybercrimes, Botnets. Attack Vector, Proliferation of Mobile and Wireless Devices, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Network and Computer Attacks,

Unit II: Tools and Methods : Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, Sniffers, Spoofing, Session Hijacking Buffer over flow, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Identity Theft (ID Theft), Foot Printing and Social Engineering, Port Scanning, Enumeration

Unit III : Cyber Crime Investigation: Introduction, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.

Unit IV: Computer Forensics and Investigations: Understanding Computer Forensics, Preparing for Computer Investigations. Current Computer Forensics Tools: Evaluating Computer Forensics Tools, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating and Testing Forensics Software, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Graphics and Network Forensics, E-mail Investigations, Cell Phone and Mobile Device Forensics

Unit V: Cyber Crime Legal Perspectives: Introduction, Cybercrime and the Legal Landscape around the World, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment, Cyberlaw, Technology and Students: Indian Scenario.



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TEXT BOOKS:

1. Sunit Belapure Nina Godbole “Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, WILEY, 2011.
2. Nelson Phillips and Enfinger Stuart, “Computer Forensics and Investigations”, Cengage Learning, New Delhi, 2009.

REFERENCE BOOKS:

1. Michael T. Simpson, Kent Backman and James E. Corley, “Hands on Ethical Hacking and Network Defence”, Cengage, 2019.
2. Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.
3. Alfred Basta, Nadine Basta, Mary Brown and Ravinder Kumar “Cyber Security and Cyber Laws”, Cengage, 2018.

Web References:

1. CERT-In Guidelines- <http://www.cert-in.org.in/>
2. <https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks> [Online Course]
3. <https://computersecurity.stanford.edu/free-online-videos> [Free Online Videos]
4. Nikolai Zeldovich. 6.858 Computer Systems Security. Fall 2014. Massachusetts Institute of Technology: MIT OpenCourseWare, <https://ocw.mit.edu>. License: Creative Commons BY-NC-SA.

Course Outcomes:

At the end of the course, student will be able to

- Explain the computer forensics fundamentals.
- Describe the types of computer forensic technology
- Analyze various computer forensic systems.
- Illustrate the methods for data recovery, evidence collection and data seizure.



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OPEN ELECTIVES OFFERED BY ECE



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		L	T	P	C
		3	0	0	3
PRINCIPLES OF COMMUNICATION Open Elective (OE1)					

Course objectives:

This course will enable students to:

- Understand simple systems for generating and demodulating AM, DSB, SSB and VSB signals
- Understand the concepts in Angle modulation for the design of communications systems
- Study simple systems for generating and demodulating frequency modulated signals
- Learn the concepts of random process and various types of noise.
- Study the performance of the communication system in presence of noise.
- Learn pulse modulation and sampling techniques

UNIT-1

Amplitude modulation: Introduction, Amplitude Modulation: Time & Frequency – Domain description, switching modulator, Envelop detector.

Double side band-suppressed carrier modulation: Time and Frequency – Domain description, Ring modulator, Coherent detection, Costas Receiver, Quadrature Carrier Multiplexing.

Single side-band and vestigial sideband methods of modulation: SSB Modulation, VSB Modulation, Frequency Translation, Frequency- Division Multiplexing, Theme Example: VSB Transmission of Analog and Digital Television

UNIT-II

Angle modulation: Basic definitions, Frequency Modulation: Narrow Band FM, Wide Band FM, Transmission bandwidth of FM Signals, Generation of FM Signals, Demodulation of FM Signals, FM Stereo Multiplexing,

Phase-Locked Loop: Nonlinear model of PLL, Linear model of PLL, Nonlinear Effects in FM Systems. The Super heterodyne Receiver

UNIT-III

Random variables & process: Introduction, Probability, Conditional Probability, Random variables, Several Random Variables. Statistical Averages: Function of a random variable, Moments, Random Processes, Mean, Correlation and Covariance function: Properties of autocorrelation function, Cross-correlation functions.

Noise: Shot Noise, Thermal noise, White Noise, Noise Equivalent Bandwidth, Noise Figure.



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UNIT-IV

Noise in analog modulation: Introduction, Receiver Model, Noise in DSB-SC receivers, Noise in AM receivers, Threshold effect, Noise in FM receivers, Capture effect, FM threshold effect, FM threshold reduction, Pre-emphasis and De-emphasise in FM.

UNIT-V

Digital representation of analog signals: Introduction, Why Digitize Analog Sources?, The Sampling process, Pulse Amplitude Modulation, Time Division Multiplexing, Pulse-Position Modulation, Generation of PPM Waves, Detection of PPM Waves, The Quantization Process, Quantization Noise,

Pulse Code Modulation: Sampling, Quantization, Encoding, Regeneration, Decoding, Filtering, Multiplexing

Text books:

1. Principles of Communication Systems – H Taub & D. Schilling, Gautam Sahe, TMH, 2007, 3rd Edition.
2. Communication Systems – B.P. Lathi, BS Publication, 2006.

References:

1. Principles of Communication Systems - Simon Haykin, John Wiley, 2nd Edition.
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.
3. Communication Systems – R.P. Singh, SP Sapre, Second Edition TMH, 2007.

Course Outcomes:

At the end of the course, students will be able to:

- Analyze the performance of analog modulation schemes in time and frequency domains.
- Analyze the performance of angle modulated signals.
- Characterize analog signals in time domain as random processes and noise
- Characterize the influence of channel on analog modulated signals
- Determine the performance of analog communication systems in terms of SNR
- Analyze pulse amplitude modulation, pulse position modulation, pulse code modulation and TDM systems.



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		L	T	P	C
		3	0	0	3
EMBEDDED SYSTEMS					
Open Elective (OE2)					

Course Objectives:

The main objectives of this course are given below :

- The basic concepts of an embedded system are introduced.
- The various elements of embedded hardware and their design principles are explained.
- Different steps involved in the design and development of firmware for embedded systems is elaborated.
- Internals of Real-Time operating system and the fundamentals of RTOS based embedded firmware design is discussed.
- Fundamental issues in hardware software co-design were presented and explained.
- Familiarize with the different IDEs for firmware development for different family of processors/controllers and embedded operating systems.
- Embedded system implementation and testing tools are introduced and discussed.

UNIT-I

INTRODUCTION: Embedded system-Definition, history of embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems, the typical embedded system-core of the embedded system, Memory, Sensors and Actuators, Communication Interface, Embedded firmware, Characteristics of an embedded system, Quality attributes of embedded systems, Application-specific and Domain-Specific examples of an embedded system.

UNIT-II

EMBEDDED HARDWARE DESIGN: Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock.

UNIT-III

EMBEDDED FIRMWARE DESIGN: Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

UNIT-IV

REAL TIME OPERATING SYSTEM: Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling, Task communication, Task synchronisation.

HARDWARE SOFTWARE CO-DESIGN: Fundamental Issues in Hardware Software Co-Design, Computational models in embedded design, Hardware software Trade-offs, Integration of Hardware and Firmware.



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UNIT-V:

EMBEDDED SYSTEM DEVELOPMENT, IMPLEMENTATION AND TESTING:The integrated development environment, Types of files generated on cross-compilation, Deassembler/Decompiler, Simulators, Emulators and Debugging, Target hardware debugging, Embedded Software development process and tools, Interpreters, Compilers and Linkers, Debugging tools, Quality assurance and testing of the design, Testing on host machine, Simulators, Laboratory Tools.

Text Books:

1. Embedded Systems Architecture- By Tammy Noergaard, Elsevier Publications,2013.
2. Embedded Systems-By Shibu. K.V-Tata McGraw Hill Education Private Limited,2013.

References:

1. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications,2013.
2. Embedded Systems-Lyla B.Das-Pearson Publications,2013.

Course Outcomes:

At the end of this course the student can able to:

- Understand the basic concepts of an embedded system and able to know an embedded system design approach to perform a specificfunction.
- The hardware components required for an embedded system and the design approach of an embeddedhardware.
- The various embedded firmware design approaches on embeddedenvironment.
- Understand how to integrate hardware and firmware of an embedded system using real time operatingsystem.



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE STRUCTURE AND SYLLABUS

For

B. Tech COMPUTER SCIENCE &ENGINEERING

(Applicable for batches admitted from 2019-2020)



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE STRUCTURE - R19

I Year – I SEMESTER

S. No	Course Code	Subjects	L	T	P	Credits
1	HS1101	English	3	0	0	3
2	BS1101	Mathematics - I	3	0	0	3
3	BS1106	Applied Chemistry	3	0	0	3
4	ES1112	Fundamentals of Computer Science	3	0	0	3
5	ES1103	Engineering Drawing	1	0	3	2.5
6	HS1102	English Lab	0	0	3	1.5
7	BS1107	Applied Chemistry Lab	0	0	3	1.5
8	ES1105	IT Workshop	0	0	3	1.5
9	MC1101	Environmental Science	3	0	0	0
Total Credits			16	0	12	19

I Year – II SEMESTER

S. No	Course Code	Subjects	L	T	P	Credits
1	BS1202	Mathematics – II	3	0	0	3
2	BS1203	Mathematics – III	3	0	0	3
3	BS1204	Applied Physics	3	0	0	3
4	ES1201	Programming for Problem Solving using C	3	0	0	3
5	ES1213	Digital Logic Design	3	0	0	3
6	BS1205	Applied Physics Lab	0	0	3	1.5
7	HS1203	Communication Skills Lab	0	1	2	2
8	ES1202	Programming for Problem Solving using C Lab	0	0	3	1.5
9	PR1201	Engineering Exploration Project	0	0	2	1
10	MC1204	Constitution of India	3	0	0	0
Total Credits			18	1	10	21



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II Year – I SEMESTER

S.No	Course Code	Courses	L	T	P	Credits
1	CS2101	Mathematical Foundations of Computer Science	3	1	0	4
2	CS2102	Software Engineering	3	0	0	3
3	ES2101	Python Programming	3	0	0	3
4	CS2103	Data Structures	3	0	0	3
5	CS2104	Object Oriented Programming through C++	3	0	0	3
6	CS2105	Computer Organization	3	0	0	3
7	ES2102	Python Programming Lab	0	0	3	1.5
8	CS2106	Data Structures through C++ Lab	0	0	3	1.5
9	MC2101	Essence of Indian Traditional Knowledge	2	0	0	0
10	MC2102	Employability Skills- I*	2	0	0	0
Total			23	1	6	22
*Internal Evaluation through Seminar / Test for 50 marks						

II Year – II SEMESTER

S.No	Course Code	Courses	L	T	P	Credits
1	BS2201	Probability and Statistics	3	0	0	3
2	CS2201	Java Programming	2	1	0	3
3	CS2202	Operating Systems	3	0	0	3
4	CS2203	Database Management Systems	3	1	0	4
5	CS2204	Formal Languages and Automata Theory	3	0	0	3
6	CS2205	Java Programming Lab	0	0	3	1.5
7	CS2206	UNIX Operating System Lab	0	0	2	1
8	CS2207	Database Management Systems Lab	0	0	3	1.5
9	MC2201	Professional Ethics & Human Values	3	0	0	0
10	PR2201	Socially Relevant Project*	0	0	2	1
Total			17	2	10	21
*Internal Evaluation through Seminar for 50 marks						



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III Year – I SEMESTER

S.No	Course Code	Courses	L	T	P	Credits
1	CS3101	Data Warehousing and Data Mining	3	0	0	3
2	CS3102	Computer Networks	3	0	0	3
3	CS3103	Compiler Design	3	0	0	3
4	CS3104	Artificial Intelligence	3	0	0	3
5	PE3101	Professional Elective- I 1. Computer Graphics 2. Principles of Programming Languages 3. Advanced Data Structures 4. Software Testing Methodologies 5. Advanced Computer Architecture	3	0	0	3
6	CS3105	Computer Networks Lab	0	0	2	1
7	CS3106	AI Tools & Techniques Lab	0	0	3	1.5
8	CS3107	Data Mining Lab	0	0	3	1.5
9	MC3101	Employability Skills -II*	2	0	0	0
Total			17	0	8	19
*Internal Evaluation through Seminar / Test for 50 marks						

III Year – II SEMESTER

S.No	Course Code	Courses	L	T	P	Credits
1	CS3201	Web Technologies	3	0	0	3
2	CS3202	Distributed Systems	3	0	0	3
3	CS3203	Design and Analysis of Algorithms	3	0	0	3
4	PE3201	Professional Elective -II (NPTEL/SWAYAM) Duration: 12 Weeks Minimum *Course/subject title can't be repeated	3	0	0	3
5	OE3201	Open Elective- I (Inter Disciplinary)	3	0	0	3
6	HS3201	Managerial Economics and Financial Accountancy	3	0	0	3
7	CS3204	Web Technologies Lab	0	0	4	2
9	PR3201	Industrial Training / Skill Development Programmes / Research Project in higher learning institutes	0	0	0	1
Total			18	0	4	21



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
IV Year – I SEMESTER

S.No	Course Code	Courses	L	T	P	Credits
1	CS4101	Cryptography and Network Security	3	0	0	3
2	CS4102	UML & Design Patterns	3	0	0	3
3	CS4103	Machine Learning	3	0	0	3
4	OE4101	Open Elective -II (Inter Disciplinary)	3	0	0	3
5	PE4101	Professional Elective- III 1. Mobile Computing 2. Data Science 3. NoSQL Databases 4. Internet of Things 5. Software Project Management	3	0	0	3
6	PE4102	Professional Elective- IV 1. Web Services 2. Cloud Computing 3. Mean Stack Technologies 4. Ad-hoc and Sensor Networks 5. Cyber Security & Forensics	3	0	0	3
7	CS4104	UML Lab #	0	0	2	1
8	PR4101	Project- I	0	0	0	2
9	MC4101	IPR & Patents	3	0	0	0
Total			21	0	2	21
# Relevant theory to be taught in the lab						

IV Year – II SEMESTER

S.No	Course Code	Courses	L	T	P	Credits
1	HS4201	Management and Organizational Behavior	3	0	0	3
2	OE4201	Open Elective- III (Inter Disciplinary)	3	0	0	3
3	PE4201	Professional Elective-V 1. Deep Learning 2. Quantum Computing 3. DevOps 4. Blockchain Technologies 5. Big Data Analytics	3	0	0	3
4	PR4201	Project- II	0	0	0	7
Total			9	0	0	16



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Open Electives to be offered by CSE for Other Branches:

Open Elective I: <ol style="list-style-type: none">1. Data Structures2. Java Programming3. Data Base Management Systems4. C++ Programming5. Operating Systems6. Internet of Things	Open Elective II: <ol style="list-style-type: none">1. Problem Solving using Python2. Web Technologies3. Machine Learning4. Distributed Computing5. AI Tools & Techniques6. Data Science
Open Elective III: <ol style="list-style-type: none">1. Big Data2. Image Processing3. Mobile Application Development4. Cyber Security5. Deep Learning6. Blockchain Technologies	



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester		L	T	P	C
		3	0	0	3
ENGLISH (HS1101)					

Introduction

The course is designed to train students in receptive (listening and reading) as well as productive and interactive (speaking and writing) skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from *learning about the language* to *using the language*. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as IELTS, TOEFL, or BEC, besides being able to express themselves clearly in speech and competently handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratory sessions.

Course Objectives

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Course Outcomes

At the end of the module, the learners will be able to

- understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
- ask and answer general questions on familiar topics and introduce oneself/others
- employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
- recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
- form sentences using proper grammatical structures and correct word forms

UNIT I

Lesson-1: A Drawer full of happiness from “Infotech English”, Maruthi Publications

Lesson-2: Deliverance by Premchand from “The Individual Society”, Pearson Publications.

(Non-detailed)

Listening: Listening to short audio texts and identifying the topic. Listening to short audio texts



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and identifying the context and specific pieces of information to answer a series of questions both in speaking and writing.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests. Self introductions and introducing others.

Reading: Skimming text to get the main idea. Scanning to look for specific pieces of information.

Reading for Writing: Paragraph writing (specific topics) using suitable cohesive devices; linkers, sign posts and transition signals; mechanics of writing - punctuation, capital letters.

Vocabulary: Technical vocabulary from across technical branches (20) GRE Vocabulary (20) (Antonyms and Synonyms, Word applications) Verbal reasoning and sequencing of words.

Grammar: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countables and uncountables; singular and plural basic sentence structures; simple question form - wh-questions; word order in sentences.

Pronunciation: Vowels, Consonants, Plural markers and their realizations

UNIT II

Lesson-1: Nehru's letter to his daughter Indira on her birthday from "Infotech English", Maruthi Publications

Lesson-2: Bosom Friend by Hira Bansode from "The Individual Society", Pearson Publications. (Non-detailed)

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts, both in speaking and writing.

Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks.

Functional English: Greetings and leave takings.

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words) (Antonyms and Synonyms, Word applications)

Grammar: Use of articles and zero article; prepositions.

Pronunciation: Past tense markers, word stress-di-syllabic words

UNIT III

Lesson-1: Stephen Hawking-Positivity 'Benchmark' from "Infotech English", Maruthi Publications

Lesson-2: Shakespeare's Sister by Virginia Woolf from "The Individual Society", Pearson Publications. (Non-detailed)

Listening: Listening for global comprehension and summarizing what is listened to, both in speaking and writing.

Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed.

Functional English: Complaining and Apologizing.

Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension. Critical reading.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Letter writing-types, format and principles of letter writing. E-mail etiquette, Writing CV's.

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary



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(20 words) (Antonyms and Synonyms, Word applications) Association, sequencing of words
Grammar: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Pronunciation: word stress-poly-syllabic words

UNIT IV

Lesson-1: Liking a Tree, Unbowed: Wangari Maathai-biography from “Infotech English”, Maruthi Publications

Lesson-2: Telephone Conversation-Wole Soyinka from “The Individual Society”, Pearson Publications. (Non-detailed)

Listening: Making predictions while listening to conversations/ transactional dialogues without video (only audio); listening to audio-visual texts.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. Functional English: Permissions, Requesting, Inviting.

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicative process or display complicated data.

Reading for Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. Writing SOP, writing for media.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Cloze Encounters.

Grammar: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms

Pronunciation: Contrastive Stress

UNIT V

Lesson-1: Stay Hungry-Stay foolish from “Infotech English”, Maruthi Publications

Lesson-2: Still I Rise by Maya Angelou from “The Individual Society”, Pearson Publications. (Non-detailed)

Listening: Identifying key terms, understanding concepts and interpreting the concepts both in speaking and writing.

Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides. Functional English: Suggesting/Opinion giving.

Reading: Reading for comprehension. RAP Strategy Intensive reading and Extensive reading techniques.

Reading for Writing: Writing academic proposals- writing research articles: format and style.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Coherence, matching emotions.

Grammar: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Pronunciation: Stress in compound words

Text books:

- 1) “Infotech English”, Maruthi Publications. (Detailed)
- 2) “The Individual Society”, Pearson Publications. (Non-detailed)



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Reference books:

- 1) Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
- 2) Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
- 3) Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
- 4) Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.



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I Year - I Semester		L	T	P	C
		3	0	0	3
MATHEMATICS-I (BS1101) (Common to all Branch's for I Year B. Tech)					

Course Objectives:

- This course will illuminate the students in the concepts of calculus.
- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Course Outcomes:

At the end of the course, the student will be able to

- Utilize mean value theorems to real life problems (L3)
- Solve the differential equations related to various engineering fields (L3)
- Familiarize with functions of several variables which is useful in optimization (L3)
- Apply double integration techniques in evaluating areas bounded by region (L3)
- Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems (L5)

UNIT I: Sequences, Series and Mean value theorems: (10 hrs)

Sequences and Series: Convergences and divergence – Ratio test – Comparison tests – Integral test – Cauchy's root test – Alternate series – Leibnitz's rule.

Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders.

UNIT II: Differential equations of first order and first degree: (10 hrs)

Linear differential equations – Bernoulli's equations – Exact equations and equations reducible to exact form.

Applications: Newton's Law of cooling – Law of natural growth and decay – Orthogonal trajectories – Electrical circuits.

UNIT III: Linear differential equations of higher order: (10 hrs)

Non-homogeneous equations of higher order with constant coefficients – with non-homogeneous term of the type e^{ax} , $\sin ax$, $\cos ax$, polynomials in x^n , $e^{ax} V(x)$ and $x^n V(x)$ – Method of Variation of parameters.

Applications: LCR circuit, Simple Harmonic motion.

UNIT IV: Partial differentiation: (10 hrs)

Introduction – Homogeneous function – Euler's theorem – Total derivative – Chain rule – Jacobian – Functional dependence – Taylor's and Mc Laurent's series expansion of functions of two variables.

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).



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UNIT V: Multiple integrals: (8 hrs)
Double and Triple integrals – Change of order of integration – Change of variables.
Applications: Finding Areas and Volumes.

Text Books:

- 1) B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
- 2) B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

- 1) Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India.
- 2) Joel Hass, Christopher Heil and Maurice D. Weir, Thomas calculus, 14th Edition, Pearson.
- 3) Lawrence Tury, Advanced Engineering Mathematics, CRC Press, 2013.
- 4) Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.



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I Year - I Semester		L	T	P	C
		3	0	0	3
APPLIED CHEMISTRY (BS1106)					

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

Course Objectives:

- *Importance* of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- *Outline* the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
- *Express* the increase in demand as wide variety of advanced materials are introduced; which have excellent engineering properties.
- *Explain* the crystal structures, and the preparation of semiconductors. Magnetic properties are also studied.
- *Recall* the increase in demand for power and hence alternative sources of power are studied due to depleting sources of fossil fuels. Advanced instrumental techniques are introduced.

UNIT I: Polymer Technology

Polymerisation:- Introduction-methods of polymerization (emulsion and suspension)-physical and mechanical properties.

Plastics: Compounding-fabrication (compression, injection, blown film, extrusion) - preparation, properties and applications of PVC, polycarbonates and Bakelite-mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste.

Elastomers:- Natural rubber-drawbacks-vulcanization-preparation, properties and applications of synthetic rubbers (Buna S, thiokol and polyurethanes).

Composite materials: Fiber reinforced plastics-conducting polymers-biodegradable polymers-biopolymers-biomedical polymers.

Learning Outcomes: *At the end of this unit, the students will be able to*

- *Outline* the properties of polymers and various additives added and different methods of forming plastic materials.
- *Explain* the preparation, properties and applications of some plastic materials.
- *Interpret* the mechanism of conduction in conducting polymers .
- *Discuss* natural and synthetic rubbers and their applications.

UNIT II: Electrochemical Cells and Corrosion

Single electrode potential-Electrochemical series and uses of series-standard hydrogen electrode, calomel electrode-concentration cell-construction of glass electrode-Batteries: Dry cell, Ni-Cd cells, Ni-Metal hydride cells, Li ion battery, zinc air cells-Fuel cells: H₂-O₂, CH₃OH-O₂, phosphoric acid, molten carbonate.

Corrosion:- Definition-theories of corrosion (chemical and electrochemical)-galvanic corrosion, differential aeration corrosion, stress corrosion, waterline corrosion-passivity of metals-galvanic series-factors influencing rate of corrosion-corrosion control (proper designing, cathodic protection)-Protective coatings: Surface preparation, cathodic and anodic coatings, electroplating,



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electroless plating (nickel). Paints (constituents, functions, special paints).

Learning Outcomes: *At the end of this unit, the students will be able to*

- *Explain* the theory of construction of battery and fuel cells.
- *Categorize* the reasons for corrosion and study some methods of corrosion control.

UNIT III: Material Chemistry

Part I:

Non-elemental semiconducting materials:- Stoichiometric, controlled valency & chalcogen photo/semiconductors-preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling, epitaxy, diffusion, ion implantation) - Semiconductor devices (p-n junction diode as rectifier, junction transistor).

Insulators & magnetic materials: electrical insulators-ferro and ferri magnetism-Hall effect and its applications.

Part II:

Nano materials:- Introduction-sol-gel method- characterization by BET, SEM and TEM methods-applications of graphene-carbon nanotubes and fullerenes: Types, preparation and applications

Liquid crystals:- Introduction-types-applications.

*Super conductors:-*Type –I, Type II-characteristics and applications

Learning Outcomes: *At the end of this unit, the students will be able to*

- *Understand* the importance of materials like nanomaterials and fullerenes and their uses.
- *Understand* liquid crystals and superconductors.
- *Understand* the preparation of semiconductors.

UNIT IV: Advanced Concepts/Topics in Chemistry

Computational chemistry: Introduction, Ab Initio studies

Molecular switches: characteristics of molecular motors and machines, Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid-base controlled molecular shuttle, a molecular elevator, an autonomous light-powered molecular motor

Learning Outcomes: *At the end of this unit, the students will be able to*

- *Obtain* the knowledge of computational chemistry
- *Understand* importance molecular machines

UNIT V: Spectroscopic Techniques & Non Conventional Energy Sources

Part A: SPECTROSCOPIC TECHNIQUES

Electromagnetic spectrum-UV (laws of absorption, instrumentation, theory of electronic spectroscopy, Frank-condon principle, chromophores and auxochromes, intensity shifts, applications), FT-IR (instrumentation and IR of some organic compounds, applications)-magnetic resonance imaging and CT scan (procedure & applications).

Part B: NON CONVENTIONAL ENERGY SOURCES

Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, tidal and wave power, ocean thermal energy conversion.

Learning Outcomes: *At the end of this unit, the students will be able to*

- understand the principles of different analytical instruments.
- explain the different applications of analytical instruments.
- design sources of energy by different natural sources.



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Text Books:

- 1) Engineering Chemistry by Jain and Jain; Dhanpat Rai Publishing Co.

Reference Books:

- 1) Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2019 edition.



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I Year - I Semester		L	T	P	C
		3	0	0	3
FUNDAMENTALS OF COMPUTER SCIENCE (ES1112)					

Course Objectives:

This course is designed to:

- Explain the concepts of computers and classify based on type and generation.
- Demonstrate the techniques of writing algorithms pseudo codes & schematic flow of logic in software development process.
- Teach about the purpose of networks and types of networks and media to connect the computers
- Teach about Operating Systems and its concepts.
- Illustrate about database architecture and its components
- Illustrate about distributed computing, peer to peer, grid, cloud on demand and utility computing.

Course Outcomes:

On completion of the course the student will be able to

- Illustrate the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming.
- Recognize the Computer networks, types of networks and topologies.
- Summarize the concepts of Operating Systems and Databases.
- Recite the Advanced Computer Technologies like Distributed Computing & Wireless Networks.

UNIT I

A Simple Computer System: Central processing unit, the further need of secondary storage, Types of memory, Hardware, Software and people.

Peripheral Devices: Input, Output and storage, Data Preparation, Factors affecting input, Input devices, Output devices, Secondary devices, Communication between the CPU and Input/ Output devices. (Text Book 1)

UNIT II

Problem Solving and Programming: Algorithm development, Flowcharts, Looping, some programming features, Pseudo code, the one-zero game, some structured programming concepts, documents.

Programming Languages: Machine Language and assembly language, high -level and low level languages, Assemblers, Compilers, and Interpreters (Text Book 1)

UNIT III

Computer Networks: Introduction to computer Networks, Network topologies-Bus topology, star topology, Ring topology, Mesh topology, Hybrid topology, Types of Networks: Local area Network, Wide Area Networks, Metropolitan Networks, Campus/ Corporate Area Network, Personal Area Network, Network Devices- Hub, Repeater, Switch, Bridge, Router, Gateway, Network interface Card, Open System Inter connection Model (Text Book 2)

Operating systems: Introduction, Evolution of operating systems, Process Management- Process control block, Process operations, Process scheduling, Command Interpreter, Popular operating



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systems- Microsoft DOS, Microsoft Windows, UNIX and Linux. (Text Book 2)

UNIT IV

Database Systems: File-Oriented Approach, Database-oriented Approach-Components of Database system, Advantages & Disadvantages of Database approach, Applications of Database systems, Database views, Three-schema architecture, Database models-Hierarchical model, Network Model, relational Model, Object-oriented Data Model, Components of database management systems, Retrieving Data through Queries (Text Book 2)

Computer Systems and Development: Investigation, Analysis, Design, system processing and general program design, Presentation to management and users, Implementation, Documents. (Text Book 1)

UNIT V

Emerging Computer Technologies: Distributed Networking, Peer-to-peer Computing, Categorization of Peer-to-peer system Applications of Peer-to-peer networks, Grid Computing-components of Grid computing, Applications of Grid computing,, Cloud Computing-characteristics of cloud computing systems, cloud computing services, cloud computing architecture, cloud computing applications, Cloud computing concerns

Wireless Networks: Wireless network operations, Types of wireless networks, security in wireless Networks, Limitations of wireless Networks, Bluetooth – Bluetooth Piconets, Avoiding Interference in Bluetooth Devices, Bluetooth Security, Differences between Bluetooth and Wireless Networks. (Text Book 2)

Text Books:

1. An Introduction to Computer studies –Noel Kalicharan-Cambridge
2. Fundamentals of Computers –Reema Thareja-Oxford higher education

References Books:

1. Introduction to Information Technology – ITL education Solution Limited, Pearson
2. Computer Science and overview-J. Glenn Brookshear, Dennis Brylow-Pearson



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I Year - I Semester		L	T	P	C
		1	0	3	2.5
ENGINEERING DRAWING (ES1103)					

Course Objectives:

- Engineering drawing being the principal method of communication for engineers, the objective is to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

Course Outcomes:

- The student will learn how to visualize 2D & 3D objects.

UNIT I

Objective: To introduce the students to use drawing instruments and to draw polygons, Engg. Curves.

Polygons: Constructing regular polygons by general methods, inscribing and describing polygons on circles.

Curves: Parabola, Ellipse and Hyperbola by general and special methods, cycloids, involutes, tangents & normals for the curves.

Scales: Plain scales, diagonal scales and vernier scales

UNIT II

Objective: To introduce the students to use orthographic projections, projections of points & simple lines. To make the students draw the projections of the lines inclined to both the planes.

Orthographic Projections: Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines, line parallel to both the planes, line parallel to one plane and inclined to other plane.

Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces.

UNIT III

Objective: The objective is to make the students draw the projections of the plane inclined to both the planes.

Projections of planes: regular planes perpendicular/parallel to one reference plane and inclined to the other reference plane; inclined to both the reference planes.

UNIT IV

Objective: The objective is to make the students draw the projections of the various types of solids in different positions inclined to one of the planes.

Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to both the planes.

UNIT V

Objective: The objective is to represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.

Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer Aided Design, Drawing practice using Auto CAD, Creating 2D&3D drawings of objects using Auto CAD



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Note: In the End Examination there will be no question from CAD.

Text Books:

- 1) Engineering Drawing by N.D. Butt, Chariot Publications
- 2) Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers

Reference Books:

- 1) Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers
- 2) Engineering Graphics for Degree by K.C. John, PHI Publishers
- 3) Engineering Graphics by PI Varghese, McGrawHill Publishers
- 4) Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age



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I Year - I Semester		L	T	P	C
		0	0	3	1.5
ENGLISH LAB (HS1102)					

UNIT I

Vowels, Consonants, Pronunciation, Phonetic Transcription

UNIT II

Past tense markers, word stress-di-syllabic words, Poly-Syllabic words

UNIT III

Rhythm & Intonation

UNIT IV

Contrastive Stress (Homographs)

UNIT V

Word Stress: Weak and Strong forms

Stress in compound words

References books:

- 1) Infotech English, Maruthi Publications (with Compact Disc).
- 2) Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
- 3) English Pronunciation in use- Mark Hancock, Cambridge University Press.
- 4) English Phonetics and Phonology-Peter Roach, Cambridge University Press.
- 5) English Pronunciation in use- Mark Hewings, Cambridge University Press.
- 6) English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
- 7) English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.



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I Year - I Semester		L	T	P	C
		0	0	3	1.5
APPLIED CHEMISTRY LAB (BS1107)					

Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions, volumetric titrations, quantitative analysis

- 1) Determination of HCl using standard Na_2CO_3 solution.
- 2) Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.
- 3) Determination of Mn (II) using standard oxalic acid solution.
- 4) Determination of ferrous iron using standard $\text{K}_2\text{Cr}_2\text{O}_7$ solution.
- 5) Determination of copper (II) using standard hypo solution.
- 6) Determination of temporary and permanent hardness of water using standard EDTA solution.
- 7) Determination of iron (III) by a colorimetric method.
- 8) Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
- 9) Determination of the concentration of strong acid vs strong base (by conductometric method).
- 10) Determination of strong acid vs strong base (by potentiometric method).
- 11) Determination of Mg^{+2} present in an antacid.
- 12) Determination of CaCO_3 present in an egg shell.
- 13) Estimation of Vitamin C.
- 14) Determination of phosphoric content in soft drinks.
- 15) Adsorption of acetic acid by charcoal.
- 16) Preparation of nylon-6, 6 and Bakelite (demonstration only).

Of the above experiments at-least 10 assessment experiments should be completed in a semester.

Outcomes: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Reference Books:

- 1) A Textbook of Quantitative Analysis, Arthur J. Vogel.



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I Year - I Semester		L	T	P	C
		0	0	3	1.5
IT WORKSHOP (ES1105)					

Course Objectives:

The objective of IT Workshop is to

- Explain the internal parts of a computer, peripherals, I/O ports, connecting cables
- Demonstrate basic command line interface commands on Linux
- Teach the usage of Internet for productivity and self paced lifelong learning
- Describe about Compression, Multimedia and Antivirus tools
- Demonstrate Office Tools such as Word processors, Spreadsheets and Presentation tools

Course Outcomes:

Students should be able to:

- Assemble and disassemble components of a PC
- Construct a fully functional virtual machine, Summarize various Linux operating system commands,
- Secure a computer from cyber threats, Learn and practice programming skill in Github, Hackerrank, Codechef, HackerEarth etc.
- Recognize characters & extract text from scanned images, Create audio files and podcasts
- Create video tutorials and publishing, Use office tools for documentation, Build interactive presentations, Build websites, Create quizzes & analyze responses.

Computer Hardware:

Experiment 1: Identification of peripherals of a PC, Laptop, Server and Smart Phones: Prepare a report containing the block diagram along with the configuration of each component and its functionality, Input/ Output devices, I/O ports and interfaces, main memory, cache memory and secondary storage technologies, digital storage basics, networking components and speeds.

Operating Systems:

Experiment 2: Virtual Machine setup:

- Setting up and configuring a new Virtual Machine
- Setting up and configuring an existing Virtual Machine
- Exporting and packaging an existing Virtual Machine into a portable format

Experiment 2: Operating System installation:

- Installing an Operating System such as Linux on Computer hardware.

Experiment 3: Linux Operating System commands:

- General command syntax
- Basic *help* commands
- Basic File system commands
- Date and Time
- Basic Filters and Text processing
- Basic File compression commands
- Miscellaneous: apt-get, vi editor

Networking and Internet:

Experiment 4: Networking Commands:

- ping, ssh, ifconfig, scp, netstat, ipstat, nslookup, traceroute, telnet, host, ftp, arp, wget, route



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Experiment 5: Internet Services:

- Web Browser usage and advanced settings like LAN, proxy, content, privacy, security, cookies, extensions/ plugins
- Antivirus installation, configuring a firewall, blocking pop-ups
- Email creation and usage, Creating a Digital Profile on LinkedIn
- Source control on Github, Hackerrank, Codechef, HackerEarth, etc
- Google hangout/ Skype/ gotomeeting video conferencing
- archive.org for accessing archived resources on the web

Productivity Tools:

Experiment 6: Demonstration and Practice on archival and compression tools

- scanning and image editing tools
- OCR and text extraction
- audio players, recording using Mic, editing, podcast preparation
- video players, recording using webcam/camcorder, editing
- podcast, screencast, vodcast, webcasting

Office Tools:

Experiment 7: Demonstration and Practice on Text Editors like Notepad++, Sublime Text, Atom, Brackets, Visual code, etc

Experiment 8: Demonstration and practice on Microsoft Word, Power Point

Experiment 9: Demonstration and practice on Microsoft Excel.

Experiment 10: Demonstration and practice on LaTeX and produce professional pdf documents.

Experiment 12: Cloud based productivity enhancement and collaboration tools:

- Store, sync, and share files with ease in the cloud using Google Drive
- Document creation and editing text documents in your web browser using Google docs
- Handle task lists, create project plans, analyze data with charts and filters using Google Sheets
- Create pitch decks, project presentations, training modules using Google Slides
- Manage event registrations, create quizzes, analyze responses using Google Forms
- Build public sites, internal project hubs using Google Sites
- Online collaboration through cross-platform support using Jamboard
- Keep track of important events, sharing one's schedule, and create multiple calendars using Google Calendar

Text Books:

- 1) Computer Fundamentals, Anita Goel, Pearson Education, 2017
- 2) PC Hardware Trouble Shooting Made Easy, TMH

References Books:

- 1) Essential Computer and IT Fundamentals for Engineering and Science Students, Dr.N.B.Vekateswarlu, S.Chand

e-Resources:

- 1) https://explorersposts.grc.nasa.gov/post631/2006-2007/computer_basics/ComputerPorts.doc
- 2) https://explorersposts.grc.nasa.gov/post631/2006-2007/bitsnbyte/Digital_Storage_Basics.doc
- 3) <https://www.thegeekstuff.com/2009/07/linux-ls-command-examples>



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- 4) <https://www.pcsuggest.com/basic-linux-commands/>
- 5) <https://www.vmware.com/pdf/VMwarePlayerManual10.pdf>
- 6) <https://geek-university.com/vmware-player/manually-install-a-guest-operating-system/>
- 7) <https://gsuite.google.com/learning-center/products/#!/>



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester		L	T	P	C
		3	0	0	0
ENVIRONMENTAL SCIENCE (MC1101)					

Course Objectives:

The objectives of the course are to impart:

- Overall understanding of the natural resources.
- Basic understanding of the ecosystem and its diversity.
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
- An understanding of the environmental impact of developmental activities.
- Awareness on the social issues, environmental legislation and global treaties.

UNIT I

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information technology in environment and human health.

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT II

Natural Resources: Natural resources and associated problems.

Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.

Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.

Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

UNIT III

Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

UNIT IV

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of



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pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT V

Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act - Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics.

The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

Text Books:

- 1) Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
- 2) Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
- 3) Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

Reference Books:

- 1) Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
- 2) A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
- 3) Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
- 4) Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014



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I Year - II Semester		L	T	P	C
		3	0	0	3
MATHEMATICS - II (BS1202)					

Course Objectives:

- To instruct the concept of Matrices in solving linear algebraic equations
- To elucidate the different numerical methods to solve nonlinear algebraic equations
- To disseminate the use of different numerical techniques for carrying out numerical integration.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Course Outcomes:

At the end of the course, the student will be able to

- develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)
- solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel (L3)
- evaluate approximating the roots of polynomial and transcendental equations by different algorithms (L5)
- apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3)
- apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations (L3)

UNIT I: Solving systems of linear equations, Eigen values and Eigen vectors: (10 hrs)

Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non-homogeneous equations linear equations – Gauss Elimination for solving system of equations – Eigen values and Eigen vectors and their properties.

UNIT-II: Cayley-Hamilton theorem and Quadratic forms: (10 hrs)

Cayley - Hamilton theorem (without proof) – Finding inverse and power of a matrix by Cayley-Hamilton theorem – Reduction to Diagonal form – Quadratic forms and nature of the quadratic forms – Reduction of quadratic form to canonical forms by orthogonal transformation. Singular values of a matrix, singular value decomposition (Ref. Book – 1).

UNIT III: Iterative methods: (8 hrs)

Introduction – Bisection method – Secant method – Method of false position – Iteration method – Newton-Raphson method (One variable and simultaneous Equations) – Jacobi and Gauss-Seidel methods for solving system of equations.

UNIT IV: Interpolation: (10 hrs)

Introduction – Errors in polynomial interpolation – Finite differences – Forward differences – Backward differences – Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula – Newton's divide difference formula.



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UNIT V: Numerical integration and solution of ordinary differential equations: (10 hrs)
Trapezoidal rule – Simpson's $1/3^{\text{rd}}$ and $3/8^{\text{th}}$ rule – Solution of ordinary differential equations by Taylor's series – Picard's method of successive approximations – Euler's method – Runge-Kutta method (second and fourth order).

Text Books:

- 1) B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
- 2) B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

- 1) David Poole, Linear Algebra- A modern introduction, 4th Edition, Cengage.
- 2) Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineering and Science, Tata Mc. Graw Hill Education.
- 3) M. K. Jain, S. R. K. Iyengar and R. K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
- 4) Lawrence Turyn, Advanced Engineering Mathematics, CRC Press.



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3
MATHEMATICS - III (BS1203)					

Course Objectives:

- To familiarize the techniques in partial differential equations
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

Course Outcomes:

At the end of the course, the student will be able to

- Interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
- Estimate the work done against a field, circulation and flux using vector calculus (L5)
- Apply the Laplace transform for solving differential equations (L3)
- Find or compute the Fourier series of periodic signals (L3)
- Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)
- Identify solution methods for partial differential equations that model physical processes (L3)

UNIT I: Vector calculus: (10 hrs)

Vector Differentiation: Gradient – Directional derivative – Divergence – Curl – Scalar Potential.

Vector Integration: Line integral – Work done – Area – Surface and volume integrals – Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof).

UNIT II: Laplace Transforms: (10 hrs)

Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Unit step function – Dirac's delta function – Inverse Laplace transforms – Convolution theorem (without proof).

Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

UNIT III: Fourier series and Fourier Transforms: (10 hrs)

Fourier Series: Introduction – Periodic functions – Fourier series of periodic function – Dirichlet's conditions – Even and odd functions – Change of interval – Half-range sine and cosine series.

Fourier Transforms: Fourier integral theorem (without proof) – Fourier sine and cosine integrals – Sine and cosine transforms – Properties – inverse transforms – Finite Fourier transforms.

UNIT IV: PDE of first order: (8 hrs)

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

UNIT V: Second order PDE and Applications: (10 hrs)

Second order PDE: Solutions of linear partial differential equations with constant coefficients – RHS term of the type e^{ax+by} , $\sin(ax+by)$, $\cos(ax+by)$, $x^m y^n$.

Applications of PDE: Method of separation of Variables – Solution of One dimensional Wave, Heat and two-dimensional Laplace equation.



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Text Books:

- 1) B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
- 2) B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

- 1) Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India.
- 2) Dean. G. Duffy, Advanced Engineering Mathematics with MATLAB, 3rd Edition, CRC Press.
- 3) Peter O' Neil, Advanced Engineering Mathematics, Cengage.
- 4) Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.



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I Year - II Semester		L	T	P	C
		3	0	0	3
APPLIED PHYSICS (BS1204)					

Course Objectives:

Physics curriculum which is re-oriented to the needs of Circuital branches of graduate engineering courses offered by Jawaharlal Nehru Technological University Kakinada that serves as a transit to understand the branch specific advanced topics. The course is designed to:

- Impart Knowledge of Physical Optics phenomena like Interference and Diffraction required to design instruments with higher resolution.
- Understand the physics of Semiconductors and their working mechanism for their utility in sensors.
- To impart the knowledge of materials with characteristic utility in appliances.

UNIT I

(10hrs)

WAVE OPTICS: Principle of Superposition - Interference of light - Conditions for sustained Interference - Interference in thin films (reflected geometry) - Newton's Rings (reflected geometry).

Diffraction - Fraunhofer Diffraction - Diffraction due to Single slit (quantitative), Double slit, N -slits and circular aperture (qualitative) – Intensity distribution curves - Diffraction Grating – Grating spectrum – missing order – resolving power – Rayleigh's criterion – Resolving powers of Microscope, Telescope and grating (qualitative).

Unit Outcomes: *The students will be able to*

- explain the need of coherent sources and the conditions for sustained interference.
- analyze the differences between interference and diffraction with applications.
- illustrate the resolving power of various optical instruments.

UNIT II

(9hrs)

QUANTUM MECHANICS: Introduction – Matter waves – de Broglie's hypothesis – Davisson-Germer experiment – G. P. Thomson experiment – Heisenberg's Uncertainty Principle – interpretation of wave function – Schrödinger Time Independent and Time Dependent wave equations – Particle in a potential box.

Unit Outcomes: *The students will be able to*

- explain the fundamental concepts of quantum mechanics.
- analyze the physical significance of wave function.
- apply Schrödinger's wave equation for energy values of a free particle .

UNIT III

(10hrs)

FREE ELECTRON THEORY & BAND THEORY OF SOLIDS : Introduction – Classical free electron theory (merits and demerits only) - Quantum Free electron theory – electrical conductivity based on quantum free electron theory – Fermi Dirac distribution function – Temperature dependence of Fermi-Dirac distribution function - expression for Fermi energy - Density of states.

Bloch's theorem (qualitative) – Kronig-Penney model(qualitative) – energy bands in crystalline solids – E Vs K diagram – classification of crystalline solids – effective mass of electron – m^* Vs K diagram - concept of hole.

Unit Outcomes: *The students will be able to*



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- explain the various electron theories.
- calculate the Fermi energy.
- analyze the physical significance of wave function .
- interpret the effects of temperature on Fermi Dirac distribution function.
- summarise various types of solids based on band theory.

UNIT IV

(9hrs)

SEMICONDUCTOR PHYSICS: Introduction – Intrinsic semi conductors - density of charge carriers - Electrical conductivity – Fermi level – extrinsic semiconductors - p-type & n-type - Density of charge carriers - Dependence of Fermi energy on carrier concentration and temperature – Hall effect- Hall coefficient - Applications of Hall effect - Drift and Diffusion currents – Einstein’s equation.

Learning Outcomes: *The students will be able to*

- classify the energy bands of semiconductors.
- outline the properties of n-type and p-type semiconductors.
- identify the type of semiconductor using Hall effect.

UNIT V

(10 hrs)

MAGNETISM & DIELECTRICS: Introduction – Magnetic dipole moment – Magnetization – Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Bohr magneton – Classification of magnetic materials: Dia, para & Ferro – Domain concept of Ferromagnetism - Hysteresis – soft and hard magnetic materials – applications of Ferromagnetic material.

Introduction - Dielectric polarization – Dielectric Polarizability, Susceptibility and Dielectric constant-types of polarizations: Electronic and Ionic (Quantitative), Orientational polarizations (qualitative) – Lorentz Internal field – Claussius-Mossoti equation - Frequency dependence of polarization – Applications of dielectrics.

Unit Outcomes: *The students will be able to*

- explain the concept of polarization in dielectric materials.
- summarize various types of polarization of dielectrics .
- interpret Lorentz field and Claussius- Mosotti relation in dielectrics.
- classify the magnetic materials based on susceptibility and their temperature dependence.
- explain the applications of dielectric and magnetic materials .
- Apply the concept of magnetism to magnetic devices.

Text Books:

- 1) “A Text book of Engineering Physics” by M.N. Avadhanulu, P.G.Kshirsagar - S.Chand Publications, 2017.
- 2) “Engineering Physics” by D.K.Bhattacharya and Poonam Tandon, Oxford press (2015).
- 3) “Engineering Physics” by R.K Gaur. and S.L Gupta., - Dhanpat Rai publishers, 2012.

Reference Books:

- 1) “Engineering Physics” by M. R. Srinivasan, New Age international publishers (2009).
- 2) “Optics” by Ajoy Ghatak, 6th Edition McGraw Hill Education, 2017.
- 3) “Solid State Physics” by A. J. Dekker, Mc Millan Publishers (2011).



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3
PROGRAMMING FOR PROBLEM SOLVING USING C (ES1201)					

Course Objectives:

The objectives of Programming for Problem Solving Using C are

- To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
- To gain knowledge of the operators, selection, control statements and repetition in C
- To learn about the design concepts of arrays, strings, enumerated structure and union types. To learn about their usage.
- To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor.
- To assimilate about File I/O and significance of functions

Course Outcomes:

Upon the completion of the course the student will learn

- To write algorithms and to draw flowcharts for solving problems
- To convert flowcharts/algorithms to C Programs, compile and debug programs
- To use different operators, data types and write programs that use two-way/ multi-way selection
- To select the best loop construct for a given problem
- To design and implement programs to analyze the different pointer applications
- To decompose a problem into functions and to develop modular reusable code
- To apply File I/O operations

UNIT I

Introduction to Computers: Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers

Introduction to the C Language: Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers.

Structure of a C Program: Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.

UNIT II

Bitwise Operators: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators.

Selection & Making Decisions: Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions.

Repetition: Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples.

UNIT III

Arrays: Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Example – Calculate Averages

Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code

Enumerated, Structure, and Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application.



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UNIT IV

Pointers: Introduction, Pointers to pointers, Compatibility, L value and R value

Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application.

Processor Commands: Processor Commands.

UNIT V

Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter-Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers to Functions, Recursion

Text Input / Output: Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions

Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.

Text Books:

- 1) Programming for Problem Solving, Behrouz A. Forouzan, Richard F. Gilberg, CENGAGE.
- 2) The C Programming Language, Brian W. Kernighan, Dennis M. Ritchie, 2e, Pearson.

Reference Books:

- 1) Computer Fundamentals and Programming, Sumithabha Das, Mc Graw Hill.
- 2) Programming in C, Ashok N. Kamthane, Amit Kamthane, Pearson.
- 3) Computer Fundamentals and Programming in C, Pradip Dey, Manas Ghosh, OXFORD.



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3
DIGITAL LOGIC DESIGN (ES1213)					

Course objectives:

- To study the basic philosophy underlying the various number systems, negative number representation, binary arithmetic, theory of Boolean algebra and map method for minimization of switching functions.
- To introduce the basic tools for design of combinational and sequential digital logic.
- To learn simple digital circuits in preparation for computer engineering.

Course outcomes:

A student who successfully fulfills the course requirements will have demonstrated:

- An ability to define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.
- An ability to understand the different switching algebra theorems and apply them for logic functions.
- An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions.
- Students will be able to design various logic gates starting from simple ordinary gates to complex programmable logic devices & arrays.
- Students will be able to design various sequential circuits starting from flip-flop to registers and counters.

UNIT I: Digital Systems and Binary Numbers

Digital Systems, Binary Numbers, Octal and Hexadecimal Numbers, Complements of Numbers, Signed Binary Numbers, Arithmetic addition and subtraction, 4-bit codes: BCD, EXCESS 3, alphanumeric codes, 9's complement, 2421, etc..

UNIT II: Concept of Boolean algebra

Basic Theorems and Properties of Boolean algebra, Boolean Functions, Canonical and Standard Forms, Minterms and Maxterms.

Gate level Minimization

Map Method, Three-Variable K-Map, Four Variable K-Maps. Products of Sum Simplification, Sum of Products Simplification, Don't – Care Conditions, NAND and NOR Implementation, ExclusiveOR Function.

UNIT III: Combinational Logic

Introduction, Analysis Procedure, Binary Adder–Subtractor, Binary Multiplier, Decoders, Encoders, Multiplexers, Demultiplexers, Priority Encoder, Code Converters, Magnitude Comparator, HDL Models of Combinational Circuits.

Realization of Switching Functions Using PROM, PAL and PLA.

UNIT IV: Synchronous Sequential Logic

Introduction to Sequential Circuits, Storage Elements: Latches, Flip-Flops, RS- Latch Using NAND and NOR Gates, Truth Tables. RS, JK, T and D Flip Flops, Truth and Excitation Tables, Conversion of Flip Flops.



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UNIT V: Registers and Counters

Registers, Shift Registers, Ripple Counters, Synchronous Counters, Ring Counter, Johnson Counter.

Text Books:

- 1) Digital Design, 5/e, M.Morris Mano, Michael D Ciletti, PEA.
- 2) Fundamentals of Logic Design, 5/e, Roth, Cengage.

Reference Books:

- 1) Digital Logic and Computer Design, M.Morris Mano, PEA.
- 2) Digital Logic Design, Leach, Malvino, Saha, TMH.
- 3) Modern Digital Electronics, R.P. Jain, TMH.



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester		L	T	P	C
		0	0	3	1.5
APPLIED PHYSIC LAB (ES1205)					

(Any 10 of the following listed 15 experiments)

LIST OF EXPERIMENTS:

- 1) Determination of wavelength of a source-Diffraction Grating-Normal incidence.
- 2) Newton's rings – Radius of Curvature of Plano - Convex Lens.
- 3) Determination of thickness of a spacer using wedge film and parallel interference fringes.
- 4) Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
- 5) Energy Band gap of a Semiconductor p - n junction.
- 6) Characteristics of Thermistor – Temperature Coefficients
- 7) Determination of dielectric constant by charging and discharging method
- 8) Determination of resistivity of semiconductor by Four probe method.
- 9) Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
- 10) Measurement of magnetic susceptibility by Gouy's method.
- 11) Dispersive power of diffraction grating.
- 12) Resolving Power of telescope
- 13) Resolving power of grating
- 14) Determination of Hall voltage and Hall coefficients of a given semiconductor using Hall effect.
- 15) Variation of dielectric constant with temperature.



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I Year - II Semester		L	T	P	C
		0	1	2	2
COMMUNICATION SKILLS LAB (HS1203)					

UNIT I

Oral Activity: JAM, Hypothetical Situations, Self/Peer Profile
 Common Errors in Pronunciation, Neutralising Accent

UNIT II

Oral Activity: Telephonic Etiquette, Role Plays
 Poster Presentations

UNIT III

Oral Activity: Oral Presentation skills, Public speaking
 Data Interpretation

UNIT IV

Oral Activity: Group Discussions: Do's and Don'ts- Types, Modalities

UNIT V

Oral Activity: Interview Skills: Preparatory Techniques, Frequently asked questions, Mock Interviews.
 Pronunciation: Connected speech (Pausing, Tempo, Tone, Fluency etc.,)

References:

- 1) Infotech English, Maruthi Publications (with Compact Disc).
- 2) Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
- 3) English Pronunciation in use- Mark Hancock, Cambridge University Press.
- 4) English Phonetics and Phonology-Peter Roach, Cambridge University Press.
- 5) English Pronunciation in use- Mark Hewings, Cambridge University Press.
- 6) English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
- 7) English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.
- 8) Technical Communication- Meenakshi Raman, Sangeeta Sharma, Oxford University Press.
- 9) Technical Communication- Gajendra Singh Chauhan, Smita Kashiramka, Cengage Publications.



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I Year - II Semester		L	T	P	C
		0	0	3	1.5
PROGRAMMING FOR PROBLEM SOLVING USING C LAB (ES1202)					

Course Objectives:

- Apply the principles of C language in problem solving.
- To design flowcharts, algorithms and knowing how to debug programs.
- To design & develop of C programs using arrays, strings pointers & functions.
- To review the file operations, preprocessor commands.

Course Outcomes:

By the end of the Lab, the student

- Gains Knowledge on various concepts of a C language.
- Able to draw flowcharts and write algorithms.
- Able design and development of C problem solving skills.
- Able to design and develop modular programming skills.
- Able to trace and debug a program

Exercise 1:

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.
3. Write a C program to display multiple variables.

Exercise 2:

1. Write a C program to calculate the distance between the two points.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3:

1. Write a C program to convert a string to a long integer.
2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.
3. Write a C program to calculate the factorial of a given number.

Exercise 4:

1. Write a program in C to display the n terms of even natural number and their sum.
2. Write a program in C to display the n terms of harmonic series and their sum.
 $1 + 1/2 + 1/3 + 1/4 + 1/5 \dots 1/n$ terms.
3. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5:

1. Write a program in C to print all unique elements in an array.
2. Write a program in C to separate odd and even integers in separate arrays.
3. Write a program in C to sort elements of array in ascending order.

Exercise 6:

1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a given matrix.

Exercise 7:

1. Write a program in C to search an element in a row wise and column wise sorted matrix.



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2. Write a program in C to print individual characters of string in reverse order.

Exercise 8:

1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to another string.

Exercise 9:

1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:

1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.
2. Write a program in C to add two numbers using pointers.

Exercise 11:

1. Write a program in C to add numbers using call by reference.
2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:

1. Write a program in C to swap elements using call by reference.
2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13:

1. Write a program in C to show how a function returning pointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc() function.

Exercise 14:

1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc() function. Understand the difference between the above two programs
2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15:

1. Write a program in C to check whether a number is a prime number or not using the function.
2. Write a program in C to get the largest element of an array using the function.

Exercise 16:

1. Write a program in C to append multiple lines at the end of a text file.
2. Write a program in C to copy a file in another name.
3. Write a program in C to remove a file from the disk.



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I Year - II Semester		L	T	P	C
		0	0	2	1
ENGINEERING EXPLORATION PROJECT (PR1201)					

Course Objectives:

- Build mindsets & foundations essential for designers
- Learn about the Human-Centered Design methodology and understand their real-world applications
- Use Design Thinking for problem solving methodology for investigating illdefined problems.
- Undergo several design challenges and work towards the final design challenge

Apply Design Thinking on the following Streams to

- Project Stream 1: Electronics, Robotics, IOT and Sensors
- Project Stream 2: Computer Science and IT Applications
- Project Stream 3: Mechanical and Electrical tools
- Project Stream4: Eco-friendly solutions for waste management, infrastructure, safety, alternative energy sources, Agriculture, Environmental science and other fields of engineering.

HOW TO PURSUE THE PROJECT WORK?

- The first part will be learning-based-masking students to embrace the methodology by exploring all the phases of design thinking through the wallet/ bag challenge and podcasts.
- The second part will be more discussion-based and will focus on building some necessary skills as designers and learning about complementary material for human- centered design.
- The class will then divide into teams and they will be working with one another for about 2 – 3 weeks. These teams and design challenges will be the basis for the final project and final presentation to be presented.
- The teams start with **Design Challenge** and go through all the phases more in depth from coming up with the right question to empathizing to ideating to prototyping and to testing.
- Outside of class, students will also be gathering the requirements, identifying the challenges, usability, importance etc
- At the end, Students are required to submit the final reports, and will be evaluated by the faculty.

TASKS TO BE DONE:

Task 1: Everyone is a Designer

- Understand class objectives & harness the designer mindset

Task 2: The Wallet/Bag Challenge and Podcast

- Gain a quick introduction to the design thinking methodology
- Go through all stages of the methodology through a simple design challenge
- Podcast: Observe, Listen and Engage with the surrounding environment and identify a design challenge.

Task 3: Teams & Problems

- Start Design Challenge and learn about teams & problems through this



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- Foster team collaboration, find inspiration from the environment and learn how to identify problems

Task 4: Empathizing

- Continue Design Challenge and learn empathy
- Learn techniques on how to empathize with users
- Go to the field and interview people in their environments
- Submit Activity Card

Task 5: Ideating

- Continue Design Challenge and learn how to brainstorm effectively
- Encourage exploration and foster spaces for brainstorming
- Submit Activity Card

Task 6: Prototyping

- Continue Design Challenge and learn how to create effective prototypes
- Build tangible models and use them as communication tools
- Start giving constructive feedback to classmates and teammates
- Submit Activity Card

Task 7: Testing

- Finish Design Challenge and iterate prototypes and ideas through user feedback
- Evolve ideas and prototypes through user feedback and constructive criticism
- Get peer feedback on individual and group performance
- Submit Activity Card

Task 8:

- Final Report Submission and Presentation

Note: The colleges may arrange for Guest Speakers from Various Design Fields: Graphic Design, Industrial Design, Architecture, Product Design, Organizational Design, etc to enrich the students with Design Thinking Concept.

References:

- 1) Tom Kelly, *The Art of Innovation: Lessons in Creativity From IDEO, America's Leading Design Firm* (Profile Books, 2002)
- 2) Tim Brown, *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation* (HarperBusiness, 2009)
- 3) Jeanne Liedtka, Randy Salzman, and Daisy Azer, *Design Thinking for the Greater Good: Innovation in the Social Sector* (Columbia Business School Publishing, 2017)

Other Useful Design Thinking Frameworks and Methodologies:

- Human-Centered Design Toolkit (IDEO); <https://www.ideo.com/post/design-kit>
- Design Thinking Boot Camp Bootleg (Stanford D-School); <https://dschool.stanford.edu/resources/the-bootcamp-bootleg>
- Collective Action Toolkit (frogdesign); https://www.frogdesign.com/wpcontent/uploads/2016/03/CAT_2.0_English.pdf
- Design Thinking for Educators (IDEO); <https://designthinkingforeducators.com/>



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I Year - II Semester		L	T	P	C
		3	0	0	0
CONSTITUTION OF INDIA (MC1204)					

Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative

Course Outcomes:

At the end of the course, the student will be able to have a clear knowledge on the following:

- Understand historical background of the constitution making and its importance for building a democratic India.
- Understand the functioning of three wings of the government i.e., executive, legislative and judiciary.
- Understand the value of the fundamental rights and duties for becoming good citizen of India.
- Analyze the decentralization of power between central, state and local self-government.
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.
 1. Know the sources, features and principles of Indian Constitution.
 2. Learn about Union Government, State government and its administration.
 3. Get acquainted with Local administration and Pachayati Raj.
 4. Be aware of basic concepts and developments of Human Rights.
 5. Gain knowledge on roles and functioning of Election Commission

UNIT I

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Learning outcomes: After completion of this unit student will

- Understand the concept of Indian constitution
- Apply the knowledge on directive principle of state policy
- Analyze the History, features of Indian constitution
- Evaluate Preamble Fundamental Rights and Duties

UNIT II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre-State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions;

Learning outcomes: After completion of this unit student will

- Understand the structure of Indian government
- Differentiate between the state and central government
- Explain the role of President and Prime Minister
- Know the Structure of supreme court and High court



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UNIT III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

Learning outcomes: After completion of this unit student will

- Understand the structure of state government
- Analyze the role Governor and Chief Minister
- Explain the role of state Secretariat
- Differentiate between structure and functions of state secretariat

UNIT IV

A. Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions PRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy

Learning outcomes:-After completion of this unit student will

- Understand the local Administration
- Compare and contrast district administration role and importance
- Analyze the role of Myer and elected representatives of Municipalities
- Evaluate Zillapanchayat block level organisation

UNIT V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

Learning outcomes: After completion of this unit student will

- Know the role of Election Commission apply knowledge
- Contrast and compare the role of Chief Election commissioner and Commissiononerate
- Analyze role of state election commission
- Evaluate various commissions of viz SC/ST/OBC and women

References:

- 1) Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India Pvt. Ltd.
- 2) SubashKashyap, Indian Constitution, National Book Trust
- 3) J.A. Siwach, Dynamics of Indian Government & Politics
- 4) D.C. Gupta, Indian Government and Politics
- 5) H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
- 6) J.C. Johari, Indian Government andPolitics Hans
- 7) J. Raj IndianGovernment and Politics
- 8) M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
- 9) Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

e-Resources:

- 1) nptel.ac.in/courses/109104074/8
- 2) nptel.ac.in/courses/109104045/
- 3) nptel.ac.in/courses/101104065/
- 4) www.hss.iitb.ac.in/en/lecture-details
- 5) www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – I Semester	L	T	P	C
	3	1	0	4
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE				

Course Objectives:

This course is designed to:

- To introduce the students to the topics and techniques of discrete methods and combinatorial reasoning
- To introduce a wide variety of applications. The algorithmic approach to the solution of problems is fundamental in discrete mathematics, and this approach reinforces the close ties between this discipline and the area of computer science

Course Outcomes:

At the end of the course student will be able to

- Demonstrate skills in solving mathematical problems
- Comprehend mathematical principles and logic
- Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software
- Manipulate and analyze data numerically and/or graphically using appropriate Software
- Communicate effectively mathematical ideas/results verbally or in writing

UNIT I

Mathematical Logic: Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof, Predicate Calculus: Predicates, Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.

UNIT II

Set Theory: Sets: Operations on Sets, Principle of Inclusion-Exclusion, Relations: Properties, Operations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering, Hasse Diagrams, Functions: Bijective, Composition, Inverse, Permutation, and Recursive Functions, Lattice and its Properties, Algebraic Structures: Algebraic Systems, Properties, Semi Groups and Monoids, Group, Subgroup and Abelian Group, Homomorphism, Isomorphism.

UNIT III

Combinatorics: Basis of Counting, Permutations, Permutations with Repetitions, Circular and Restricted Permutations, Combinations, Restricted Combinations, Binomial and Multinomial Coefficients and Theorems, Number Theory: Properties of Integers, Division Theorem, Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic, Fermat's and Euler's Theorems

UNIT IV

Recurrence Relations: Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations



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UNIT V

Graph Theory: Basic Concepts, Graph Theory and its Applications, Sub graphs, Graph Representations: Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Bipartite and Planar Graphs, Euler's Theorem, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Prim's and Kruskal's Algorithms, BFS and DFS Spanning Trees.

Text Books:

- 1) Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.
- 2) Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill.

Reference Books:

- 1) Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India.
- 2) Discrete Mathematical Structures, Bernard Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
- 3) Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.

e-Resources:

- 1) <https://nptel.ac.in/courses/106/106/106106094/>



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II Year – I Semester		L	T	P	C
		3	0	0	3
SOFTWARE ENGINEERING					

Course Objectives:

This course is designed to:

- Give exposure to phases of Software Development, common process models including Waterfall, and the Unified Process, and hands-on experience with elements of the agile process
- Give exposure to a variety of Software Engineering practices such as requirements analysis and specification, code analysis, code debugging, testing, traceability, and version control
- Give exposure to Software Design techniques

Course Outcomes:

Students taking this subject will gain software engineering skills in the following areas:

- Ability to transform an Object-Oriented Design into high quality, executable code
- Skills to design, implement, and execute test cases at the Unit and Integration level
- Compare conventional and agile software methods

UNIT I

The Nature of Software, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths. A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology.

UNIT II

Agility, Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, A Tool Set for the Agile Process, Software Engineering Knowledge, Core Principles, Principles That Guide Each Framework Activity, Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

UNIT III

Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling, Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modelling, Requirements Modeling for WebApps.

UNIT IV

Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model, Software Architecture, Architectural Genres, Architectural Styles, Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow, Components, Designing Class-Based Components, Conducting Component-Level Design, Component-Level Design for WebApps, Designing Traditional Components, Component-Based Development.



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UNIT V

The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, WebApp Interface Design, Design Evaluation, Elements of Software Quality Assurance, SQA Tasks, Goals & Metrics, Statistical SQA, Software Reliability, A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, Validation Testing, System Testing, The Art of Debugging, Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basis Path Testing.

Text Books:

- 1) Software Engineering a practitioner's approach, Roger S. Pressman, Seventh Edition, McGraw Hill Higher Education.
- 2) Software Engineering, Ian Sommerville, Ninth Edition, Pearson.

Reference Books:

- 1) Software Engineering, A Precise Approach, PankajJalote, Wiley India, 2010.
- 2) Software Engineering, Ugrasen Suman, Cengage.

e-Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105182/>



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II Year – I Semester		L	T	P	C
		3	0	0	3
PYTHON PROGRAMMING					

Course Objectives:

The Objectives of Python Programming are

- To learn about Python programming language syntax, semantics, and the runtime environment
- To be familiarized with universal computer programming concepts like data types, containers
- To be familiarized with general computer programming concepts like conditional execution, loops & functions
- To be familiarized with general coding techniques and object-oriented programming

Course Outcomes:

- Develop essential programming skills in computer programming concepts like data types, containers
- Apply the basics of programming in the Python language
- Solve coding tasks related conditional execution, loops
- Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming

UNIT I

Introduction: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output.

Data Types, and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules.

Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.

UNIT II

Control Statement: Definite iteration for Loop Formatting Text for output, Selection if and if else Statement Conditional Iteration The While Loop

Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings and Number Systems, String Methods Text Files.

UNIT III

List and Dictionaries: Lists, Defining Simple Functions, Dictionaries

Design with Function: Functions as Abstraction Mechanisms, Problem Solving with Top Down Design, Design with Recursive Functions, Case Study Gathering Information from a File System, Managing a Program's Namespace, Higher Order Function.

Modules: Modules, Standard Modules, Packages.



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UNIT IV

File Operations: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations

Object Oriented Programming: Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance , overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using OOPS support

Design with Classes: Objects and Classes, Data modeling Examples, Case Study An ATM, Structuring Classes with Inheritance and Polymorphism

UNIT V

Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions.

Graphical User Interfaces: The Behavior of Terminal Based Programs and GUI -Based, Programs, Coding Simple GUI-Based Programs, Other Useful GUI Resources.

Programming: Introduction to Programming Concepts with Scratch.

Text Books

- 1) Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage.
- 2) Python Programming: A Modern Approach, Vamsi Kurama, Pearson.

Reference Books:

- 1) Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press.
- 2) Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

e-Resources:

- 1) https://www.tutorialspoint.com/python3/python_tutorial.pdf



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – I Semester	L	T	P	C
	3	0	0	3
DATA STRUCTURES				

Course Objectives:

The objective of the course is to

- Introduce the fundamental concept of data structures and abstract data types
- Emphasize the importance of data structures in developing and implementing efficient algorithms
- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms

Course Outcomes:

After completing this course a student will be able to:

- Summarize the properties, interfaces, and behaviors of basic abstract data types
- Discuss the computational efficiency of the principal algorithms for sorting & searching
- Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writing programs
- Demonstrate different methods for traversing trees

UNIT I

Data Structures - Definition, Classification of Data Structures, Operations on Data Structures, Abstract Data Type (ADT), Preliminaries of algorithms. Time and Space complexity.

Searching - Linear search, Binary search, Fibonacci search.

Sorting- Insertion sort, Selection sort, Exchange (Bubble sort, quick sort), distribution (radix sort), merging (Merge sort) algorithms.

UNIT II

Linked List: Introduction, Single linked list, Representation of Linked list in memory, Operations on Single Linked list-Insertion, Deletion, Search and Traversal ,Reversing Single Linked list, Applications on Single Linked list- Polynomial Expression Representation ,Addition and Multiplication, Sparse Matrix Representation using Linked List, Advantages and Disadvantages of Single Linked list, Double Linked list-Insertion, Deletion, Circular Linked list-Insertion, Deletion.

UNIT III

Queues: Introduction to Queues, Representation of Queues-using Arrays and using Linked list, Implementation of Queues-using Arrays and using Linked list, Application of Queues-Circular Queues, Deques, Priority Queues, Multiple Queues.

Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on Stacks, Linked list Representation of Stacks, Operations on Linked Stack, Applications-Reversing list, Factorial Calculation, Infix to Postfix Conversion, Evaluating Postfix Expressions.

UNIT IV

Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees using Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations: Insertion, Deletion, Tree Traversals, Applications-Expression Trees, Heap Sort, Balanced Binary Trees-AVL Trees, Insertion, Deletion and Rotations.



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UNIT V

Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prim's & Kruskal's Algorithm, Dijkstra's shortest path, Transitive closure, Warshall's Algorithm.

Text Books:

- 1) Data Structures Using C. 2nd Edition. Reema Thareja, Oxford.
- 2) Data Structures and algorithm analysis in C, 2nded, Mark Allen Weiss.

Reference Books:

- 1) Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press.
- 2) Data Structures: A PseudoCode Approach, 2/e, Richard F. Gilberg, Behrouz A. Forouzon, Cengage.
- 3) Data Structures with C, Seymour Lipschutz TMH

e-Resources:

- 1) <http://algs4.cs.princeton.edu/home/>
- 2) https://faculty.washington.edu/jstraub/dsa/Master_2_7a.pdf



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – I Semester	L	T	P	C
	3	0	0	3
OBJECT ORIENTED PROGRAMMING THROUGH C++				

Course Objectives:

- Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects
- Understand dynamic memory management techniques using pointers, constructors, destructors
- Describe the concept of function overloading, operator overloading, virtual functions and polymorphism
- Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming
- Demonstrate the use of various OOPs concepts with the help of programs

Course Outcomes:

By the end of the course, the student

- Classify object oriented programming and procedural programming
- Apply C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling
- Build C++ classes using appropriate encapsulation and design principles
- Apply object oriented or non-object oriented techniques to solve bigger computing problems

UNIT I

Introduction to C++: Difference between C and C++, Evolution of C++, The Object Oriented Technology, Disadvantage of Conventional Programming, Key Concepts of Object Oriented Programming, Advantage of OOP, Object Oriented Language.

UNIT II

Classes and Objects & Constructors and Destructor: Classes in C++, Declaring Objects, Access Specifiers and their Scope, Defining Member Function, Overloading Member Function, Nested class, Constructors and Destructors, Introduction, Constructors and Destructor, Characteristics of Constructor and Destructor, Application with Constructor, Constructor with Arguments parameterized Constructor, Destructors, Anonymous Objects.

UNIT III

Operator Overloading and Type Conversion & Inheritance: The Keyword Operator, Overloading Unary Operator, Operator Return Type, Overloading Assignment Operator (=), Rules for Overloading Operators, Inheritance, Reusability, Types of Inheritance, Virtual Base Classes- Object as a Class Member, Abstract Classes, Advantages of Inheritance, Disadvantages of Inheritance.

UNIT IV

Pointers & Binding Polymorphisms and Virtual Functions: Pointer, Features of Pointers, Pointer Declaration, Pointer to Class, Pointer Object, The this Pointer, Pointer to Derived Classes and Base Class, Binding Polymorphisms and Virtual Functions, Introduction, Binding in C++, Virtual Functions, Rules for Virtual Function, Virtual Destructor.

UNIT V

Generic Programming with Templates & Exception Handling: Definition of class Templates,



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Normal Function Templates, Over Loading of Template Function, Bubble Sort Using Function Templates, Difference between Templates and Macros, Linked Lists with Templates, Exception Handling, Principles of Exception Handling, The Keywords try throw and catch, Multiple Catch Statements, Specifying Exceptions.

Overview of Standard Template Library, STL Programming Model, Containers, Sequence Containers, Associative Containers, Algorithms, Iterators, Vectors, Lists, Maps.

Text Books:

- 1) A First Book of C++, Gary Bronson, Cengage Learning.
- 2) The Complete Reference C++, Herbert Schildt, TMH.

Reference Books:

- 1) Object Oriented Programming C++, Joyce Farrell, Cengage.
- 2) C++ Programming: from problem analysis to program design, DS Malik, Cengage Learning
- 3) Programming in C++, Ashok N Kamthane, Pearson 2nd Edition

e- Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105151/>
- 2) <https://github.com/topics/object-oriented-programming>



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II Year – I Semester	L	T	P	C
	3	0	0	3
COMPUTER ORGANIZATION				

Course Objectives:

The course objectives of Computer Organization are to discuss and make student familiar with the

- Principles and the Implementation of Computer Arithmetic
- Operation of CPUs including RTL, ALU, Instruction Cycle and Busses
- Fundamentals of different Instruction Set Architectures and their relationship to the CPU Design
- Memory System and I/O Organization
- Principles of Operation of Multiprocessor Systems and Pipelining

Course Outcomes:

By the end of the course, the student will

- Develop a detailed understanding of computer systems
- Cite different number systems, binary addition and subtraction, standard, floating-point, and micro operations
- Develop a detailed understanding of architecture and functionality of central processing unit
- Exemplify in a better way the I/O and memory organization
- Illustrate concepts of parallel processing, pipelining and inter processor communication

UNIT I

Basic Structure of Computers: Basic Organization of Computers, Historical Perspective, Bus Structures, Data Representation: Data types, Complements, Fixed Point Representation. Floating, Point Representation. Other Binary Codes, Error Detection Codes.

Computer Arithmetic: Addition and Subtraction, Multiplication Algorithms, Division Algorithms.

UNIT II

Register Transfer Language and Microoperations: Register Transfer language. Register Transfer Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit.

Basic Computer Organization and Design: Instruction Codes, Computer Register, Computer Instructions, Instruction Cycle, Memory – Reference Instructions. Input –Output and Interrupt, Complete Computer Description.

UNIT III

Central Processing Unit: General Register Organization, STACK Organization. Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer.

Microprogrammed Control: Control Memory, Address Sequencing, Micro Program example, Design of Control Unit.

UNIT IV

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupts, Direct Memory Access.



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UNIT V

Multi Processors: Introduction, Characteristics of Multiprocessors, Interconnection Structures, Inter Processor Arbitration.

Pipeline: Parallel Processing, Pipelining, Instruction Pipeline, RISC Pipeline, Array Processor.

Text Books:

- 1) Computer System Architecture, M. Morris Mano, Third Edition, Pearson, 2008.
- 2) Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, 5/e, McGraw Hill, 2002.

Reference Books:

- 1) Computer Organization and Architecture, William Stallings, 6/e, Pearson, 2006.
- 2) Structured Computer Organization, Andrew S. Tanenbaum, 4/e, Pearson, 2005.
- 3) Fundamentals of Computer Organization and Design, Sivarama P. Dandamudi, Springer, 2006.

e- Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105163/>
- 2) <http://www.cuc.ucc.ie/CS1101/David%20Tarnoff.pdf>



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		0	0	3	1.5
PYTHON PROGRAMMING LAB					

Course Objectives:

The aim of Python Programming Lab is

- To acquire programming skills in core Python.
- To acquire Object Oriented Skills in Python
- To develop the skill of designing Graphical user Interfaces in Python
- To develop the ability to write database applications in Python

Course Outcomes:

By the end of this lab, the student is able to

- Write, Test and Debug Python Programs
- Use Conditionals and Loops for Python Programs
- Use functions and represent Compound data using Lists, Tuples and Dictionaries
- Use various applications using python

- 1) Write a program that asks the user for a weight in kilograms and converts it to pounds. There are 2.2 pounds in a kilogram.
- 2) Write a program that asks the user to enter three numbers (use three separate input statements). Create variables called total and average that hold the sum and average of the three numbers and print out the values of total and average.
- 3) Write a program that uses a *for* loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86, 89.
- 4) Write a program that asks the user for their name and how many times to print it. The program should print out the user's name the specified number of times.
- 5) Use a *for* loop to print a triangle like the one below. Allow the user to specify how high the triangle should be.

```
*
**
***
****
```

- 6) Generate a random number between 1 and 10. Ask the user to guess the number and print a message based on whether they get it right or not.
- 7) Write a program that asks the user for two numbers and prints *Close* if the numbers are within .001 of each other and *Not close* otherwise.
- 8) Write a program that asks the user to enter a word and prints out whether that word contains any vowels.
- 9) Write a program that asks the user to enter two strings of the same length. The program should then check to see if the strings are of the same length. If they are not, the program should print an appropriate message and exit. If they are of the same length, the program should alternate the characters of the two strings. For example, if the user enters *abcde* and *ABCDE* the program should print out *AaBbCcDdEe*.



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- 10) Write a program that asks the user for a large integer and inserts commas into it according to the standard American convention for commas in large numbers. For instance, if the user enters 1000000, the output should be 1,000,000.
- 11) In algebraic expressions, the symbol for multiplication is often left out, as in $3x+4y$ or $3(x+5)$. Computers prefer those expressions to include the multiplication symbol, like $3*x+4*y$ or $3*(x+5)$. Write a program that asks the user for an algebraic expression and then inserts multiplication symbols where appropriate.
- 12) Write a program that generates a list of 20 random numbers between 1 and 100.
 - (a) Print the list.
 - (b) Print the average of the elements in the list.
 - (c) Print the largest and smallest values in the list.
 - (d) Print the second largest and second smallest entries in the list
 - (e) Print how many even numbers are in the list.
- 13) Write a program that asks the user for an integer and creates a list that consists of the factors of that integer.
- 14) Write a program that generates 100 random integers that are either 0 or 1. Then find the longest run of zeros, the largest number of zeros in a row. For instance, the longest run of zeros in $[1,0,1,1,0,0,0,1,0,0]$ is 4.
- 15) Write a program that removes any repeated items from a list so that each item appears at most once. For instance, the list $[1,1,2,3,4,3,0,0]$ would become $[1,2,3,4,0]$.
- 16) Write a program that asks the user to enter a length in feet. The program should then give the user the option to convert from feet into inches, yards, miles, millimeters, centimeters, meters, or kilometers. Say if the user enters a 1, then the program converts to inches, if they enter a 2, then the program converts to yards, etc. While this can be done with if statements, it is much shorter with lists and it is also easier to add new conversions if you use lists.
- 17) Write a function called *sum_digits* that is given an integer num and returns the sum of the digits of num.
- 18) Write a function called *first_diff* that is given two strings and returns the first location in which the strings differ. If the strings are identical, it should return -1.
- 19) Write a function called *number_of_factors* that takes an integer and returns how many factors the number has.
- 20) Write a function called *is_sorted* that is given a list and returns True if the list is sorted and False otherwise.
- 21) Write a function called *root* that is given a number x and an integer n and returns $x^{1/n}$. In the function definition, set the default value of n to 2.
- 22) Write a function called *primes* that is given a number n and returns a list of the first n primes. Let the default value of n be 100.
- 23) Write a function called *merge* that takes two already sorted lists of possibly different lengths, and merges them into a single sorted list.
 - (a) Do this using the sort method.
 - (b) Do this without using the sort method.



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- 24) Write a program that asks the user for a word and finds all the smaller words that can be made from the letters of that word. The number of occurrences of a letter in a smaller word can't exceed the number of occurrences of the letter in the user's word.
- 25) Write a program that reads a file consisting of email addresses, each on its own line. Your program should print out a string consisting of those email addresses separated by semicolons.
- 26) Write a program that reads a list of temperatures from a file called *temps.txt*, converts those temperatures to Fahrenheit, and writes the results to a file called *ftemps.txt*.
- 27) Write a class called Product. The class should have fields called name, amount, and price, holding the product's name, the number of items of that product in stock, and the regular price of the product. There should be a method *get_price* that receives the number of items to be bought and returns a the cost of buying that many items, where the regular price is charged for orders of less than 10 items, a 10% discount is applied for orders of between 10 and 99 items, and a 20% discount is applied for orders of 100 or more items. There should also be a method called *make_purchase* that receives the number of items to be bought and decreases amount by that much.
- 28) Write a class called Time whose only field is a time in seconds. It should have a method called *convert_to_minutes* that returns a string of minutes and seconds formatted as in the following example: if seconds is 230, the method should return '5:50'. It should also have a method called *convert_to_hours* that returns a string of hours, minutes, and seconds formatted analogously to the previous method.
- 29) Write a class called Converter. The user will pass a length and a unit when declaring an object from the class—for example, `c = Converter(9,'inches')`. The possible units are inches, feet, yards, miles, kilometers, meters, centimeters, and millimeters. For each of these units there should be a method that returns the length converted into those units. For example, using the Converter object created above, the user could call `c.feet()` and should get 0.75 as the result.
- 30) Write a Python class to implement `pow(x, n)`.
- 31) Write a Python class to reverse a string word by word.
- 32) Write a program that opens a file dialog that allows you to select a text file. The program then displays the contents of the file in a textbox.
- 33) Write a program to demonstrate Try/except/else.
- 34) Write a program to demonstrate try/finally and with/as.



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II Year – I Semester	L	T	P	C
	0	0	3	1.5
DATA STRUCTURES THROUGH C++ LAB				

Course Objectives:

The objective of this lab is to

- Demonstrate procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects.
- Understand dynamic memory management techniques using pointers, constructors, destructors, etc
- Demonstrate the concept of function overloading, operator overloading, virtual functions and polymorphism, inheritance.
- Demonstrate the different data structures implementation.

Course Outcomes:

By the end of this lab the student is able to

- Apply the various OOPs concepts with the help of programs.
- Use basic data structures such as arrays and linked list.
- Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths.
- Use various searching and sorting algorithms.

Exercise -1 (Classes Objects)

Create a Distance class with:

- feet and inches as data members
 - member function to input distance
 - member function to output distance
 - member function to add two distance objects
1. Write a main function to create objects of DISTANCE class. Input two distances and output the sum.
 2. Write a C++ Program to illustrate the use of Constructors and Destructors (use the above program.)
 3. Write a program for illustrating function overloading in adding the distance between objects (use the above problem)

Exercise – 2 (Access)

Write a program for illustrating Access Specifiers public, private, protected

1. Write a program implementing Friend Function
2. Write a program to illustrate this pointer
3. Write a Program to illustrate pointer to a class

Exercise -3 (Operator Overloading)

1. Write a program to Overload Unary, and Binary Operators as Member Function, and Non Member Function.
 1. Unary operator as member function
 2. Binary operator as non member function
2. Write a c ++ program to implement the overloading assignment = operator

Exercise -4 (Inheritance)

1. Write C++ Programs and incorporating various forms of Inheritance
 - i) Single Inheritance
 - ii) Hierarchical Inheritance



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- iii) Multiple Inheritances
- iv) Multi-level inheritance
- v) Hybrid inheritance

2. Also illustrate the order of execution of constructors and destructors in inheritance

Exercise -5(Templates, Exception Handling)

- 1. a) Write a C++ Program to illustrate template class
- 2. b) Write a Program to illustrate member function templates
- 3. c) Write a Program for Exception Handling Divide by zero
- 4. d) Write a Program to rethrow an Exception

Exercise -6 (Searching)

Write C program that use both recursive and non recursive functions to perform Linear search for a Key value in a given list.

b) Write C program that use both recursive and non recursive functions to perform Binary search for a Key value in a given list.

Exercise -7 (Sorting-I)

- a) Write C program that implement Bubble sort, to sort a given list of integers in ascending order
- b) Write C program that implement Quick sort, to sort a given list of integers in ascending order
- c) Write C program that implement Insertion sort, to sort a given list of integers in ascending order

Exercise -8(Sorting-II)

- a) Write C program that implement radix sort, to sort a given list of integers in ascending order
- b) Write C program that implement merge sort, to sort a given list of integers in ascending order

Exercise -9(Singly Linked List)

- a) Write a C program that uses functions to create a singly linked list
- b) Write a C program that uses functions to perform insertion operation on a singly linked list
- c) Write a C program that uses functions to perform deletion operation on a singly linked list
- d) Write a C program to reverse elements of a single linked list.

Exercise -10(Queue)

- a) Write C program that implement Queue (its operations) using arrays.
- b) Write C program that implement Queue (its operations) using linked lists

Exercise -11(Stack)

- a) Write C program that implement stack (its operations) using arrays
- b) Write C program that implement stack (its operations) using Linked list
- c) Write a C program that uses Stack operations to evaluate postfix expression

Exercise -12(Binary Search Tree)

- a) Write a C program to Create a BST
- b) Write a C program to insert a node into a BST.
- c) Write a C program to delete a node from a BST.
- d) Write a recursive C program for traversing a binary tree in preorder, inorder and postorder.



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II Year – I Semester		L	T	P	C
		3	0	0	0
ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE					

Course Objectives:

To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system

- The course aim of the importing basic principle of third process reasoning and inference sustainability is at the course of Indian traditional knowledge system
- To understand the legal framework and traditional knowledge and biological diversity act 2002 and geographical indication act 2003
- The courses focus on traditional knowledge and intellectual property mechanism of traditional knowledge and protection
- To know the student traditional knowledge in different sector

Course Outcomes:

After completion of the course, students will be able to:

- Understand the concept of Traditional knowledge and its importance
- Know the need and importance of protecting traditional knowledge
- Know the various enactments related to the protection of traditional knowledge
- Understand the concepts of Intellectual property to protect the traditional knowledge

UNIT I

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge

Learning Outcomes:

At the end of the unit, the student will able to:

- Understand the traditional knowledge.
- Contrast and compare characteristics importance kinds of traditional knowledge.
- Analyze physical and social contexts of traditional knowledge.
- Evaluate social change on traditional knowledge.

UNIT II

Protection of traditional knowledge: the need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

Learning Outcomes:

At the end of the unit, the student will able to:

- Know the need of protecting traditional knowledge.
- Apply significance of tk protection.
- Analyze the value of tk in global economy.
- Evaluate role of government

UNIT III

Legal framework and TK: A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmers Rights Act,



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2001 (PPVFR Act);B:The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indications act 2003.

Learning Outcomes:

At the end of the unit the student will able to:

- Understand legal framework of TK.
- Contrast and compare the ST and other traditional forest dwellers
- Analyze plant variant protections
- Evaluate farmers right act

UNIT IV

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

Learning Outcomes:

At the end of the unit, the student will able to:

- Understand TK and IPR
- Apply systems of TK protection.
- Analyze legal concepts for the protection of TK.
- Evaluate strategies to increase the protection of TK.

UNIT V

Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

Learning Outcomes:

At the end of the unit, the student will able to:

- Know TK in different sectors.
- Apply TK in engineering.
- Analyze TK in various sectors.
- Evaluate food security and protection of TK in the country.

Reference Books:

- 1) Traditional Knowledge System in India, by Amit Jha, 2009.
- 2) Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, PratibhaPrakashan 2012.
- 3) Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002
- 4) "Knowledge Traditions and Practices of India" Kapil Kapoor, Michel Danino

e-Resources:

- 1) <https://www.youtube.com/watch?v=LZP1StpYEPM>
- 2) <http://nptel.ac.in/courses/121106003/>



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II Year – I Semester		L	T	P	C
		2	0	0	0
EMPLOYABILITY SKILLS - I					

Course Objectives:

The aim of this course is

- To explore and practice basic communication skills
- To learn skills for effective discussions & team work
- To assess and improve personal grooming

Course Outcomes:

By the end of this course, the student

- Establish effective communication with employers, supervisors, and co-workers
- Identify to explore their values and career choices through individual skill assessments
- Adapts positive attitude and appropriate body language
- Interpret the core competencies to succeed in professional and personal life

A list of vital employability skills from the standpoint of engineering students with discussion how to potentially develop such skills through campus life.

- 1) Soft Skills: An Introduction – Definition and Significance of Soft Skills; Process, Importance and Measurement of Soft Skill Development.
- 2) Self-Discovery: Discovering the Self; Setting Goals; Beliefs, Values, Attitude, Virtue.
- 3) Positivity and Motivation: Developing Positive Thinking and Attitude; Driving out Negativity; Meaning and Theories of Motivation; Enhancing Motivation Levels.
- 4) Interpersonal Communication: Interpersonal relations; communication models, process and barriers; team communication; developing interpersonal relationships through effective communication; listening skills; essential formal writing skills; corporate communication styles – assertion, persuasion, negotiation.
- 5) Public Speaking: Skills, Methods, Strategies and Essential tips for effective public speaking.
- 6) Group Discussion: Importance, Planning, Elements, Skills assessed; Effectively disagreeing, Initiating, Summarizing and Attaining the Objective.
- 7) Non-Verbal Communication: Importance and Elements; Body Language.
- 8) Teamwork and Leadership Skills: Concept of Teams; Building effective teams; Concept of Leadership and honing Leadership skills.

References Books:

- 1) Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
- 2) S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.
- 3) R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.
- 4) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.
- 5) R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.
- 6) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.



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II Year – II Semester		L	T	P	C
		3	0	0	3
PROBABILITY AND STATISTICS					

Course Objectives:

- To familiarize the students with the foundations of probability and statistical methods
- To impart probability concepts and statistical methods in various applications Engineering

Course Outcomes:

Upon successful completion of this course, the student should be able to

- Classify the concepts of data science and its importance (L4) or (L2)
- Interpret the association of characteristics and through correlation and regression tools (L4)
- Make use of the concepts of probability and their applications (L3)
- Apply discrete and continuous probability distributions (L3)
- Design the components of a classical hypothesis test (L6)
- Infer the statistical inferential methods based on small and large sampling tests (L4)

UNIT I

Descriptive statistics and methods for data science: Data science – Statistics Introduction – Population vs Sample – Collection of data – primary and secondary data – Type of variable: dependent and independent Categorical and Continuous variables – Data visualization – Measures of Central tendency – Measures of Variability (spread or variance) – Skewness Kurtosis.

UNIT II

Correlation and Curve fitting: Correlation – correlation coefficient – rank correlation – regression coefficients and properties – regression lines – Method of least squares – Straight line – parabola – Exponential – Power curves.

UNIT III

Probability and Distributions: Probability – Conditional probability and Baye's theorem – Random variables – Discrete and Continuous random variables – Distribution function – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.

UNIT IV

Sampling Theory: Introduction – Population and samples – Sampling distribution of Means and Variance (definition only) – Central limit theorem (without proof) – Introduction to t, χ^2 and F-distributions – Point and Interval estimations – Maximum error of estimate.



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UNIT V

Tests of Hypothesis: Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Tests concerning one mean and two means (Large and Small samples) – Tests on proportions.

Text Books:

- 1) Miller and Freund's, Probability and Statistics for Engineers, 7/e, Pearson, 2008.
- 2) S. C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

Reference Books:

- 1) Shron L. Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineers and the Scientists, 8th Edition, Pearson 2007.
- 2) Jay I. Devore, Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
- 3) Sheldon M. Ross, Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011.
- 4) Johannes Ledolter and Robert V. Hogg, Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson, 2010.



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II Year – II Semester		L	T	P	C
		2	1	0	3
JAVA PROGRAMMING					

Course Objectives:

The learning objectives of this course are:

- To identify Java language components and how they work together in applications
- To learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- To learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
- To understand how to design applications with threads in Java
- To understand how to use Java APIs for program development

Course Outcomes:

By the end of the course, the student will be

- Able to realize the concept of Object Oriented Programming & Java Programming Constructs
- Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords
- Apply the concept of exception handling and Input/ Output operations
- Able to design the applications of Java & Java applet
- Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit

UNIT I

Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.

Data Types, Variables, and Operators :Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

Control Statements: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?., Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

UNIT II

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by



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Reference, Keyword this.

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

UNIT III

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.

Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

UNIT IV

Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions, try-with-resources, Catching Subclass Exception, Custom Exceptions, Nested try and catch Blocks, Rethrowing Exception, Throws Clause.

UNIT V

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Methods for Comparison of Strings, Methods for Modifying Strings, Methods for Searching Strings, Data Conversion and Miscellaneous Methods, Class String Buffer, Class String Builder.

Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread- Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.

Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, ResultSet Interface, Creating JDBC Application, JDBC Batch Processing, JDBC Transaction Management



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Text Books:

- 1) JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
- 2) The complete Reference Java, 8th edition, Herbert Schildt, TMH.

References Books:

- 1) Introduction to java programming, 7th edition by Y Daniel Liang, Pearson
- 2) Murach's Java Programming, Joel Murach

e-Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105191/>
- 2) https://www.w3schools.com/java/java_data_types.asp



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – II Semester		L	T	P	C
		3	0	0	3
OPERATING SYSTEMS					

Course Objectives:

The objectives of this course is to

- Introduce to the internal operation of modern operating systems
- Define, explain, processes and threads, mutual exclusion, CPU scheduling, deadlock, memory management, and file systems
- Understand File Systems in Operating System like UNIX/Linux and Windows
- Understand Input Output Management and use of Device Driver and Secondary Storage (Disk) Mechanism
- Analyze Security and Protection Mechanism in Operating System

Course Outcomes:

After learning, the course the students should be able to:

- Describe various generations of Operating System and functions of Operating System
- Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare their performance
- Solve Inter Process Communication problems using Mathematical Equations by various methods
- Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement Techniques
- Outline File Systems in Operating System like UNIX/Linux and Windows

UNIT I

Operating Systems Overview: Operating system functions, Operating system structure, Operating systems operations, Computing environments, Open-Source Operating Systems.

System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, operating system structure, operating system debugging, System Boot.

UNIT II

Process Concept: Process scheduling, Operations on processes, Inter-process communication, Communication in client server systems.

Multithreaded Programming: Multithreading models, Thread libraries, Threading issues.

Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling.

Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Barriers, Classical IPC Problems - Dining philosophers problem, Readers and writers problem.

UNIT III

Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation.



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Virtual Memory Management: Introduction, Demand paging, Copy on-write, Page replacement, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation.

UNIT IV

Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm, Deadlock detection and recovery, Deadlock avoidance, Deadlock prevention.

File Systems: Files, Directories, File system implementation, management and optimization.

Secondary-Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation.

UNIT V

System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights.

System Security: Introduction, Program threats, System and network threats, Cryptography for security, User authentication, Implementing security defenses, Firewalling to protect systems and networks, Computer security classification.

Case Studies: Linux, Microsoft Windows.

Text Books:

- 1) Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2013.
- 2) Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (for Interprocess Communication and File systems.)

Reference Books:

- 1) Dhamdhare D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw-Hill, 2012.
- 2) Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009
- 3) Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004.

e-Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105214/>



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – II Semester		L	T	P	C
		3	1	0	4
DATABASE MANAGEMENT SYSTEMS					

Course Objectives:

- To introduce about database management systems
- To give a good formal foundation on the relational model of data and usage of Relational Algebra
- To introduce the concepts of basic SQL as a universal Database language
- To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- To provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

Course Outcomes:

By the end of the course, the student will be able to

- Describe a relational database and object-oriented database
- Create, maintain and manipulate a relational database using SQL
- Describe ER model and normalization for database design
- Examine issues in data storage and query processing and can formulate appropriate solutions
- Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage

UNIT I

Introduction: Database system, Characteristics (Database Vs File System), Database Users(Actors on Scene, Workers behind the scene), Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

UNIT II

Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance
 BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).

UNIT III

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams. SQL: Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.

UNIT IV

Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF), Fifth Normal Form (5NF).



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UNIT V

Transaction Concept: Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.

Indexing Techniques: B+ Trees: Search, Insert, Delete algorithms, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes , Index data Structures, Hash Based Indexing: Tree base Indexing ,Comparison of File Organizations, Indexes and Performance Tuning

Text Books:

- 1) Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH
- 2) Database System Concepts,5/e, Silberschatz, Korth, TMH

Reference Books:

- 1) Introduction to Database Systems, 8/e C J Date, PEA.
- 2) Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA
- 3) Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

e-Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105175/>
- 2) <https://www.geeksforgeeks.org/introduction-to-nosql/>



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – II Semester		L	T	P	C
		3	0	0	3
FORMAL LANGUAGES AND AUTOMATA THEORY					

Course Objectives:

- To learn fundamentals of Regular and Context Free Grammars and Languages
- To understand the relation between Regular Language and Finite Automata and machines
- To learn how to design Automata's and machines as Acceptors, Verifiers and Translators
- To understand the relation between Contexts free Languages, PDA and TM
- To learn how to design PDA as acceptor and TM as Calculators

Course Outcomes:

By the end of the course students can

- Classify machines by their power to recognize languages.
- Summarize language classes & grammars relationship among them with the help of Chomsky hierarchy
- Employ finite state machines to solve problems in computing
- Illustrate deterministic and non-deterministic machines
- Quote the hierarchy of problems arising in the computer science

UNIT I

Finite Automata: Need of Automata theory, Central Concepts of Automata Theory, Automation, Finite Automata, Transition Systems, Acceptance of a String, DFA, Design of DFAs, NFA, Design of NFA, Equivalence of DFA and NFA, Conversion of NFA into DFA, Finite Automata with ϵ -Transitions, Minimization of Finite Automata, Finite Automata with output-Mealy and Moore Machines, Applications and Limitation of Finite Automata.

UNIT II

Regular Expressions, Regular Sets, Identity Rules, Equivalence of two RE, Manipulations of REs, Finite Automata and Regular Expressions, Inter Conversion, Equivalence between FA and RE, Pumping Lemma of Regular Sets, Closure Properties of Regular Sets, Grammars, Classification of Grammars, Chomsky Hierarchy Theorem, Right and Left Linear Regular Grammars, Equivalence between RG and FA, Inter Conversion.

UNIT III

Formal Languages, Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars-Elimination of Useless Symbols, ϵ -Productions and Unit Productions, Normal Forms-Chomsky Normal Form and Greibach Normal Form, Pumping Lemma, Closure Properties, Applications of Context Free Grammars.

UNIT IV

Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description, Language Acceptance of Pushdown Automata, Design of Pushdown Automata, Deterministic and Non – Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context Free Grammars, Conversion, Two Stack Pushdown Automata, Application of Pushdown Automata.



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UNIT V

Turning Machine: Definition, Model, Representation of TMs-Instantaneous Descriptions, Transition Tables and Transition Diagrams, Language of a TM, Design of TMs, Types of TMs, Church's Thesis, Universal and Restricted TM, Decidable and Un-decidable Problems, Halting Problem of TMs, Post's Correspondence Problem, Modified PCP, Classes of P and NP, NP-Hard and NP-Complete Problems.

Text Books:

- 1) Introduction to Automata Theory, Languages and Computation, J. E. Hopcroft, R. Motwani and J. D. Ullman, 3rd Edition, Pearson, 2008
- 2) Theory of Computer Science-Automata, Languages and Computation, K. L. P. Mishra and N. Chandrasekharan, 3rd Edition, PHI, 2007

Reference Books:

- 1) Elements of Theory of Computation, Lewis H.P. & Papadimition C.H., Pearson /PHI
- 2) Theory of Computation, V. Kulkarni, Oxford University Press, 2013
- 3) Theory of Automata, Languages and Computation, Rajendra Kumar, McGraw Hill, 2014

e-Resources:

- 1) <https://nptel.ac.in/courses/106/104/106104028/>



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – II Semester		L	T	P	C
		0	0	3	1.5
JAVA PROGRAMMING LAB					

Course Objectives:

The aim of this lab is to

- Practice programming in the Java
- Gain knowledge of object-oriented paradigm in the Java programming language
- Learn use of Java in a variety of technologies and on different platforms

Course Outcomes:

By the end of the course student will be able to write java program for

- Evaluate default value of all primitive data type, Operations, Expressions, Control-flow, Strings
- Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
- Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism
- Construct Threads, Event Handling, implement packages, developing applets

Exercise - 1 (Basics)

- Write a JAVA program to display default value of all primitive data type of JAVA
- Write a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.
- Five Bikers Compete in a race such that they drive at a constant speed which may or may not be the same as the other. To qualify the race, the speed of a racer must be more than the average speed of all 5 racers. Take as input the speed of each racer and print back the speed of qualifying racers.

Exercise - 2 (Operations, Expressions, Control-flow, Strings)

- Write a JAVA program to search for an element in a given list of elements using binary search mechanism.
- Write a JAVA program to sort for an element in a given list of elements using bubble sort
- Write a JAVA program to sort for an element in a given list of elements using merge sort.
- Write a JAVA program using StringBuffer to delete, remove character.

Exercise - 3 (Class, Objects)

- Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.
- Write a JAVA program to implement constructor.

Exercise - 4 (Methods)

- Write a JAVA program to implement constructor overloading.
- Write a JAVA program implement method overloading.

Exercise - 5 (Inheritance)

- Write a JAVA program to implement Single Inheritance
- Write a JAVA program to implement multi level Inheritance
- Write a java program for abstract class to find areas of different shapes

Exercise - 6 (Inheritance - Continued)

- Write a JAVA program give example for “super” keyword.
- Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?



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Exercise - 7 (Exception)

- a) Write a JAVA program that describes exception handling mechanism
- b) Write a JAVA program Illustrating Multiple catch clauses

Exercise – 8 (Runtime Polymorphism)

- a) Write a JAVA program that implements Runtime polymorphism
- b) Write a Case study on run time polymorphism, inheritance that implements in above problem

Exercise – 9 (User defined Exception)

- a) Write a JAVA program for creation of Illustrating throw
- b) Write a JAVA program for creation of Illustrating finally
- c) Write a JAVA program for creation of Java Built-in Exceptions
- d) Write a JAVA program for creation of User Defined Exception

Exercise – 10 (Threads)

- a) Write a JAVA program that creates threads by extending Thread class .First thread display “Good Morning “every 1 sec, the second thread displays “Hello “every 2 seconds and the third display “Welcome” every 3 seconds ,(Repeat the same by implementing Runnable)
- b) Write a program illustrating **isAlive** and **join ()**
- c) Write a Program illustrating Daemon Threads.

Exercise - 11 (Threads continuity)

- a) Write a JAVA program Producer Consumer Problem
- b) Write a case study on thread Synchronization after solving the above producer consumer problem

Exercise – 12 (Packages)

- a) Write a JAVA program illustrate class path
- b) Write a case study on including in class path in your os environment of your package.
- c) Write a JAVA program that import and use the defined your package in the previous Problem

Exercise - 13 (Applet)

- a) Write a JAVA program to paint like paint brush in applet.
- b) Write a JAVA program to display analog clock using Applet.
- c) Write a JAVA program to create different shapes and fill colors using Applet.

Exercise - 14 (Event Handling)

- a) Write a JAVA program that display the x and y position of the cursor movement using Mouse.
- b) Write a JAVA program that identifies key-up key-down event user entering text in a Applet.



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – II Semester		L	T	P	C
		0	0	2	1
UNIX OPERATING SYSTEM LAB					

Course Objectives:

- To understand the design aspects of operating system
- To study the process management concepts & Techniques
- To study the storage management concepts
- To familiarize students with the Linux environment
- To learn the fundamentals of shell scripting/programming

Course Outcomes:

- To use Unix utilities and perform basic shell control of the utilities
- To use the Unix file system and file access control
- To use of an operating system to develop software
- Students will be able to use Linux environment efficiently
- Solve problems using bash for shell scripting

- 1) a) Study of Unix/Linux general purpose utility command list: man, who, cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown.
 b) Study of vi editor
 c) Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system
 d) Study of Unix/Linux file system (tree structure)
 e) Study of .bashrc, /etc/bashrc and Environment variables.
- 2) Write a C program that makes a copy of a file using standard I/O, and system calls
- 3) Write a C program to emulate the UNIX ls -l command.
- 4) Write a C program that illustrates how to execute two commands concurrently with a command pipe. Ex: - ls -l | sort
- 5) Simulate the following CPU scheduling algorithms:
 (a) Round Robin (b) SJF (c) FCFS (d) Priority
- 6) Multiprogramming-Memory management-Implementation of fork (), wait (), exec() and exit (), System calls
- 7) Simulate the following:
 - a) Multiprogramming with a fixed number of tasks (MFT)
 - b) Multiprogramming with a variable number of tasks (MVT)
- 8) Simulate Bankers Algorithm for Dead Lock Avoidance
- 9) Simulate Bankers Algorithm for Dead Lock Prevention.



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- 10) Simulate the following page replacement algorithms:
 - a) FIFO b) LRU c) LFU
- 11) Simulate the following File allocation strategies
 - (a) Sequenced (b) Indexed (c) Linked
- 12) Write a C program that illustrates two processes communicating using shared memory
- 13) Write a C program to simulate producer and consumer problem using semaphores
- 14) Write C program to create a thread using pthreads library and let it run its function.
- 15) Write a C program to illustrate concurrent execution of threads using pthreads library.



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II Year – II Semester		L	T	P	C
		0	0	3	1.5
DATABASE MANAGEMENT SYSTEMS LAB					

Course Objectives:

This Course will enable students to

- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers

Course Outcomes:

At the end of the course the student will be able to:

- Utilize SQL to execute queries for creating database and performing data manipulation operations
- Examine integrity constraints to build efficient databases
- Apply Queries using Advanced Concepts of SQL
- Build PL/SQL programs including stored procedures, functions, cursors and triggers

List of Exercises:

1. Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)
5.
 - i. Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
 - ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.
8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.



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10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
12. Create a table and perform the search operation on table using indexing and non-indexing techniques.

Text Books/Suggested Reading:

- 1) Oracle: The Complete Reference by Oracle Press
- 2) Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
- 3) Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – II Semester		L	T	P	C
		3	0	0	0
PROFESSIONAL ETHICS & HUMAN VALUES					

Course Objectives:

- To create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values and Loyalty
- To appreciate the rights of others
- To create awareness on assessment of safety and risk

Course outcomes:

Students will be able to:

- Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field
- Identify the multiple ethical interests at stake in a real-world situation or practice
- Articulate what makes a particular course of action ethically defensible
- Assess their own ethical values and the social context of problems
- Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects
- Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work
- Integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research.

UNIT I

Human Values: Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others –Living Peacefully –Caring –Sharing –Honesty –Courage-Cooperation– Commitment – Empathy –Self Confidence Character –Spirituality.

Learning outcomes:

1. Learn about morals, values & work ethics.
2. Learn to respect others and develop civic virtue.
3. Develop commitment
4. Learn how to live peacefully

UNIT II

Engineering Ethics: Senses of 'Engineering Ethics-Variety of moral issued –Types of inquiry – Moral dilemmas –Moral autonomy –Kohlberg's theory-Gilligan's theory-Consensus and controversy –Models of professional roles-Theories about right action-Self-interest -Customs and religion –Uses of Ethical theories –Valuing time –Cooperation –Commitment.

Learning outcomes:

1. Learn about the ethical responsibilities of the engineers.
2. Create awareness about the customs and religions.
3. Learn time management
4. Learn about the different professional roles.



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UNIT III

Engineering as Social Experimentation: Engineering As Social Experimentation –Framing the problem –Determining the facts –Codes of Ethics –Clarifying Concepts –Application issues – Common Ground -General Principles –Utilitarian thinking respect for persons.

Learning outcomes:

1. Demonstrate knowledge to become a social experimenter.
2. Provide depth knowledge on framing of the problem and determining the facts.
3. Provide depth knowledge on codes of ethics.
4. Develop utilitarian thinking

UNIT IV

Engineers Responsibility for Safety and Risk: Safety and risk –Assessment of safety and risk – Risk benefit analysis and reducing risk-Safety and the Engineer-Designing for the safety-Intellectual Property rights (IPR).

Learning outcomes:

1. Create awareness about safety, risk & risk benefit analysis.
2. Engineer's design practices for providing safety.
3. Provide knowledge on intellectual property rights.

UNIT V

Global Issues: Globalization –Cross-culture issues-Environmental Ethics –Computer Ethics – Computers as the instrument of Unethical behavior –Computers as the object of Unethical acts – Autonomous Computers-Computer codes of Ethics –Weapons Development -Ethics and Research –Analyzing Ethical Problems in research.

Learning outcomes:

1. Develop knowledge about global issues.
2. Create awareness on computer and environmental ethics
3. Analyze ethical problems in research.
4. Give a picture on weapons development.

Text Books:

- 1) "Engineering Ethics includes Human Values" by M.Govindarajan, S.Natarajan and, V.S.Senthil Kumar-PHI Learning Pvt. Ltd-2009
- 2) "Engineering Ethics" by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.
- 3) "Ethics in Engineering" by Mike W. Martin and Roland Schinzinger –Tata McGraw-Hill– 2003.
- 4) "Professional Ethics and Morals" by Prof.A.R.Aryasri, DharamikotaSuyodhana-Maruthi Publications.
- 5) "Professional Ethics and Human Values" by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran-LaxmiPublications.
- 6) "Professional Ethics and Human Values" by Prof.D.R.Kiran-
- 7) "Indian Culture, Values and Professional Ethics" by PSR Murthy-BS Publication.



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II Year – II Semester		L	T	P	C
		0	0	2	1
SOCIALLY RELEVANT PROJECT(15HRS)					

Course Objectives:

The aim of Socially Relevant Project is to encourage students

- To express their ideas, to solve real-world problems and to complete projects
- Using human experience to gather ideas from a wide range of problems in society by observation or pooling information
- Using scientific, social-scientific, humanistic, cultural reasoning to analyze global problems

Course Outcomes:

The student learns to

- Use scientific reasoning to gather, evaluate, and interpret ideas
- Analyze and design solutions to solve the ideas
- Use one or more creative tools to complete the projects

The student can choose any one of the given below / any other socially relevant problem and work on it to produce a project document.

1. Water Conservation Related Works
2. Swatch Bharath (Internal External)
3. Helping police
4. Traffic monitoring
5. Teaching Rural Kids (Sarva siksha Abhiyan)
6. Street light monitoring
7. Electricity Conservation
8. Solar panel utilization
9. E- policing & cyber solution
10. Pollution
11. Any social related



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III Year – I Semester	L	T	P	C
	3	0	0	3
DATA WAREHOUSING AND DATA MINING				

Course Objectives:

- To understand data warehouse concepts, architecture, business analysis and tools
- To understand data pre-processing and data visualization techniques
- To study algorithms for finding hidden and interesting patterns in data
- To understand and apply various classification and clustering techniques using tools

Course Outcomes:

At the end of the course, the students will be able to:

- Design a Data warehouse system and perform business analysis with OLAP tools
- Apply suitable pre-processing and visualization techniques for data analysis
- Apply frequent pattern and association rule mining techniques for data analysis
- Apply appropriate classification techniques for data analysis
- Apply appropriate clustering techniques for data analysis

UNIT I

Data Warehousing, Business Analysis and On-Line Analytical Processing (OLAP): Basic Concepts, Data Warehousing Components, Building a Data Warehouse, Database Architectures for Parallel Processing, Parallel DBMS Vendors, Multidimensional Data Model, Data Warehouse Schemas for Decision Support, Concept Hierarchies, Characteristics of OLAP Systems, Typical OLAP Operations, OLAP and OLTP.

UNIT II

Data Mining – Introduction: Introduction to Data Mining Systems, Knowledge Discovery Process, Data Mining Techniques, Issues, applications, Data Objects and attribute types, Statistical description of data, Data Preprocessing – Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.

UNIT III

Data Mining - Frequent Pattern Analysis: Mining Frequent Patterns, Associations and Correlations, Mining Methods, Pattern Evaluation Method, Pattern Mining in Multilevel, Multi-Dimensional Space – Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns

UNIT IV

Classification: Decision Tree Induction, Bayesian Classification, Rule Based Classification, Classification by Back Propagation, Support Vector Machines, Lazy Learners, Model Evaluation and Selection, Techniques to improve Classification Accuracy

UNIT V

Clustering: Clustering Techniques, Cluster analysis, Partitioning Methods, Hierarchical methods, Density Based Methods, Grid Based Methods, Evaluation of clustering, Clustering high dimensional data, Clustering with constraints, Outlier analysis, outlier detection methods.

Text Books:

- 1) Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2012.



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- 2) Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Introduction to Data Mining, Pearson, 2016.

Reference Books:

- 1) Alex Berson and Stephen J. Smith, —Data Warehousing, Data Mining & OLAP, Tata McGraw – Hill Edition, 35th Reprint 2016.
- 2) K.P. Soman, Shyam Diwakar and V. Ajay, —Insight into Data Mining Theory and Practice, Eastern Economy Edition, Prentice Hall of India, 2006.
- 3) Ian H. Witten and Eibe Frank, —Data Mining: Practical Machine Learning Tools and Techniques, Elsevier, Second Edition.

e-Resources:

- 1) https://www.saedsayad.com/data_mining_map.htm
- 2) <https://nptel.ac.in/courses/106/105/106105174/>
- 3) (NPTEL course by Prof. Pabitra Mitra) http://onlinecourses.nptel.ac.in/noc17_mg24/preview
- 4) (NPTEL course by Dr. Nandan Sudarshanam & Dr. Balaraman Ravindran) http://www.saedsayad.com/data_mining_map.htm



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		3	0	0	3
COMPUTER NETWORKS					

Course Objectives:

The main objectives are

- Study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model
- Study data link layer concepts, design issues, and protocols
- Gain core knowledge of Network layer routing protocols and IP addressing
- Study Session layer design issues, Transport layer services, and protocols
- Acquire knowledge of Application layer and Presentation layer paradigms and protocols

Course Outcomes:

At the end of the course, the students will be able to:

- Illustrate the OSI and TCP/IP reference model
- Analyze MAC layer protocols and LAN technologies
- Design applications using internet protocols
- Implement routing and congestion control algorithms
- Develop application layer protocols

UNIT I

Introduction: History and development of computer networks, Basic Network Architectures: OSI reference model, TCP/IP reference model, and Networks topologies, types of networks (LAN, MAN, WAN, circuit switched, packet switched, message switched, extranet, intranet, Internet, wired, wireless).

UNIT II

Physical layer: Line encoding, block encoding, scrambling, modulation demodulation (both analog and digital), errors in transmission, multiplexing (FDM, TDM, WDM, OFDM, DSSS), Different types of transmission media. Data Link Layer services: framing, error control, flow control, medium access control. Error & Flow control mechanisms: stop and wait, Go back N and selective repeat. MAC protocols: Aloha, slotted aloha, CSMA, CSMA/CD, CSMA/CA, polling, token passing, scheduling.

UNIT III

Local Area Network Technology: Token Ring. Error detection (Parity, CRC), Ethernet, Fast Ethernet, Gigabit Ethernet, Personal Area Network: Bluetooth and Wireless Communications Standard: Wi-Fi (802.11) and Wi-MAX.

UNIT IV

Network layer: Internet Protocol, IPv6, ARP, DHCP, ICMP, Routing algorithms: Distance vector, Link state, Metrics, Inter-domain routing. Sub netting, Super netting, Classless addressing, Network Address Translation.



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UNIT V

Transport layer: UDP, TCP. Connection establishment and termination, sliding window, flow and congestion control, timers, retransmission, TCP extensions, Queuing theory, Single and multiple server queuing models, Little's formula. Application Layer. Network Application services and protocols including e-mail, www, DNS, SMTP, IMAP, FTP, TFTP, Telnet, BOOTP, HTTP, IPsec, Firewalls.

Text Books:

- 1) Computer Networks , Andrew S. Tanenbaum, David J. Wetherall, Pearson Education India; 5 edition, 2013
- 2) Data Communication and Networking , Behrouz A. Forouzan, McGraw Hill, 5th Edition, 2012

Reference Books:

- 1) Computer Networks: A Systems Approach, LL Peterson, BS Davie, Morgan-Kauffman , 5th Edition, 2011.
- 2) Computer Networking: A Top-Down Approach JF Kurose, KW Ross, Addison-Wesley, 5th Edition, 2009
- 3) Data and Computer Communications , William Stallings , Pearson , 8th Edition, 2007

e-Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105183/>



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III Year – I Semester	L	T	P	C
	3	0	0	3
COMPILER DESIGN				

Course Objectives:

- To study the various phases in the design of a compiler
- To understand the design of top-down and bottom-up parsers
- To understand syntax directed translation schemes
- To introduce LEX and YACC tools
- To learn to develop algorithms to generate code for a target machine

Course Outcomes:

At the end of the course, the students will be able to:

- Design, develop, and implement a compiler for any language
- Use LEX and YACC tools for developing a scanner and a parser
- Design and implement LL and LR parsers
- Design algorithms to perform code optimization in order to improve the performance of a program in terms of space and time complexity
- Apply algorithms to generate machine code

UNIT I

Language Processors, the structure of a compiler, the science of building a compiler, programming language basics.

Lexical Analysis: The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical-Analyzer Generator Lex, Finite Automata, From Regular Expressions to Automata, Design of a Lexical-Analyzer Generator, Optimization of DFA-Based Pattern Matchers.

UNIT II

Syntax Analysis: Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Recursive and Non recursive top down parsers, Bottom-Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers, Using Ambiguous Grammars, Parser Generators.

UNIT III

Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax-Directed Translation, Syntax-Directed Translation Schemes, and Implementing L-Attributed SDD's. Intermediate-Code Generation: Variants of Syntax Trees, Three-Address Code, Types and Declarations, Type Checking, Control Flow, Back patching, Switch-Statements, Intermediate Code for Procedures.

UNIT IV

Run-Time Environments: Storage organization, Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management, Introduction to Garbage Collection, Introduction to Trace-Based Collection.

Machine-Independent Optimizations: The Principal Sources of Optimization, Introduction to Data-Flow Analysis, Foundations of Data-Flow Analysis, Constant Propagation, Partial-Redundancy Elimination, Loops in Flow Graphs.

UNIT V

Code Generation: Issues in the Design of a Code Generator, The Target Language, Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, A Simple Code



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Generator.

Machine-dependent Optimizations: Peephole Optimization, Register Allocation and Assignment, Dynamic Programming Code-Generation.

Text Books:

- 1) Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Pearson.
- 2) Compiler Construction-Principles and Practice, Kenneth C Louden, Cengage Learning.

Reference Books:

- 1) Modern compiler implementation in C, Andrew W Appel, Revised edition, Cambridge University Press.
- 2) The Theory and Practice of Compiler writing, J. P. Tremblay and P. G. Sorenson, TMH
- 3) Writing compilers and interpreters, R. Mak, 3rd edition, Wiley student edition.

e-Resources:

- 1) <https://nptel.ac.in/courses/106/104/106104123/>



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III Year – I Semester		L	T	P	C
		3	0	0	3
ARTIFICIAL INTELLIGENCE					

Course Objectives:

- To have a basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language
- To have an understanding of the basic issues of knowledge representation and blind and heuristic search, as well as an understanding of other topics such as minimax, resolution, etc. that play an important role in AI programs
- To have a basic understanding of some of the more advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems, and planning

Course Outcomes:

- Outline problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem
- Apply the language/framework of different AI methods for a given problem
- Implement basic AI algorithms- standard search algorithms or dynamic programming
- Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports

UNIT I

Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends.

UNIT II

Problem solving: state-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative deepening A*, constraint satisfaction.

Problem reduction and game playing: Introduction, problem reduction, game playing, alpha beta pruning, two-player perfect information games.

UNIT III

Logic concepts: Introduction, propositional calculus, propositional logic, natural deduction system, axiomatic system, semantic tableau system in propositional logic, resolution refutation in propositional logic, predicate logic.

UNIT IV

Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames.

Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure, CYC theory, case grammars, semantic web

UNIT V

Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems

Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, Dempster-Shafer theory

Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership



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functions, multi valued logic, fuzzy logic, linguistic variables and hedges, fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems.

Text Books:

- 1) Artificial Intelligence- Saroj Kaushik, CENGAGE Learning
- 2) Artificial intelligence, A modern Approach , 2nded, Stuart Russel, Peter Norvig, PEA

Reference Books:

- 1) Artificial Intelligence- Deepak Khemani, TMH, 2013
- 2) Introduction to Artificial Intelligence, Patterson, PHI
- 3) Artificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5thed, PEA

e-Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105077/>
- 2) <http://aima.cs.berkeley.edu/>



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III Year – I Semester	L	T	P	C
	3	0	0	3
COMPUTER GRAPHICS				

Course Objectives:

- To develop, design and implement two and three dimensional graphical structures
- To enable students to acquire knowledge Multimedia compression and animations
- To learn Creation, Management and Transmission of Multimedia objects

Course Outcomes:

After learning the course, the student will be able:

- Illustrate the basics of computer graphics, different graphics systems and applications of computer graphics with various algorithms for line, circle and ellipse drawing objects for 2D transformations
- Apply projections and visible surface detection techniques for display of 3D scene on 2D screen
- Illustrate able to create the general software architecture of programs that use 3D object sets with computer graphics

UNIT I

Introduction to Graphics: Application areas of Computer Graphics, overview of graphics systems, video-display devices, graphics monitors and work stations and input devices. 2D Primitives: Output primitives-Line, Circle and Ellipse drawing algorithms, Attributes of output primitives, Two dimensional Geometric transformations, Two dimensional viewing Line, Polygon, Curve and Text clipping algorithms.

UNIT II

3D Concepts: Parallel and Perspective projections, Three dimensional object representation- Polygons, Curved lines, Splines, Quadric Surfaces, Visualization of data sets, 3D transformations, Viewing, Visible surface identification.

UNIT III

Graphics Programming: Color Models- RGB, YIQ, CMY, HSV, Animations -General Computer Animation, Raster, Keyframe. Graphics programming using OpenGL-Basic graphics primitives, Drawing three dimensional objects, Drawing three dimensional scenes.

UNIT IV

Rendering: Introduction to shading models, Flat and Smooth shading, Adding texture to faces, Adding shadows of objects, Building a camera in a program, Creating shaded objects

UNIT V

Overview of Ray Tracing: Intersecting rays with other primitives, Adding Surface texture, Reflections and Transparency, Boolean operations on Objects.

Text Books:

- 1) Donald Hearn, Pauline Baker, Computer Graphics – C Version, second edition, Pearson Education,2004.



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- 2) Schaum's Outline of Computer Graphics Second Edition, Zhiqiang Xiang, Roy A. Plastock.

Reference Books:

- 1) James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics- Principles and practice, Second Edition in C, Pearson Education, 2007.
- 2) F.S. Hill, Computer Graphics using OPENGL, Second edition, Pearson Education, 2003.

e-Resources:

- 1) <http://math.hws.edu/eck/cs424/downloads/graphicsbook-linked.pdf>
- 2) <https://nptel.ac.in/courses/106/106/106106090/>



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester	L	T	P	C
	3	0	0	3
PRINCIPLES OF PROGRAMMING LANGUAGES				

Course Objectives:

- To understand and describe syntax and semantics of programming languages
- To understand data, data types, and basic statements
- To understand call-return architecture and ways of implementing them
- To understand object-orientation, concurrency, and event handling in programming languages
- To develop programs in non-procedural programming paradigms

Course Outcomes:

- Describe the syntax and semantics of programming languages and gain practical knowledge in lexical analysis and parsing phases of a compiler
- Make use of different constructs in programming languages with merits and demerits
- Design and implement sub programs in various programming languages
- Developing the knowledge on different programming language features like object-orientation, concurrency, exception handling and event handling
- Analyzing functional paradigm and ability to write small programs using Scheme and ML and Develop programs logic paradigm and ability to write small programs using Prolog

UNIT I

Syntax and semantics: Evolution of programming languages, describing syntax, context, free grammars, attribute grammars, describing semantics, lexical analysis, parsing, recursive - decent bottom - up parsing.

UNIT II

Data, data types, and basic statements: Names, variables, binding, type checking, scope, scope rules, lifetime and garbage collection, primitive data types, strings, array types, associative arrays, record types, union types, pointers and references, Arithmetic expressions, overloaded operators, type conversions, relational and Boolean expressions, assignment statements, mixed mode assignments, control structures – selection, iterations, branching, guarded Statements.

UNIT III

Subprograms and implementations: Subprograms, design issues, local referencing, parameter passing, overloaded methods, generic methods, design issues for functions, semantics of call and return, implementing simple subprograms, stack and dynamic local variables, nested subprograms, blocks, dynamic scoping.

UNIT IV

Object- orientation, concurrency, and event handling: Object – orientation, design issues for OOP languages, implementation of object, oriented constructs, concurrency, semaphores, Monitors, message passing, threads, statement level concurrency, exception handling, event handling.



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UNIT V

Functional programming languages: Introduction to lambda calculus, fundamentals of functional programming languages, Programming with Scheme, Programming with ML
Logic programming languages: Introduction to logic and logic programming, Programming with Prolog, multi - paradigm languages.

Text Books:

- 1) Robert W. Sebesta, “Concepts of Programming Languages”, Tenth Edition, Addison Wesley, 2012.
- 2) Programming Languages, Principles & Paradigms, 2ed, Allen B Tucker, Robert E Noonan, TMH.

Reference Books:

- 1) R. Kent Dybvig, “The Scheme programming language”, Fourth Edition, MIT Press, 2009.
- 2) Jeffrey D. Ullman, “Elements of ML programming”, Second Edition, Prentice Hall, 1998.
- 3) Richard A. O’Keefe, “The craft of Prolog”, MIT Press, 2009.
- 4) W. F. Clocksin and C. S. Mellish, “Programming in Prolog: Using the ISO Standard”, Fifth Edition, Springer, 2003.



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III Year – I Semester		L	T	P	C
		3	0	0	3
ADVANCED DATA STRUCTURES					

Course Objectives:

- Describe and implement a variety of advanced data structures (hash tables, priority queues, balanced search trees, graphs)
- Analyze the space and time complexity of the algorithms studied in the course
- Identify different solutions for a given problem; analyze advantages and disadvantages to different solutions
- Demonstrate an understanding of Amortization
- Demonstrate an understanding of various search trees

Course Outcomes:

Upon completion of the course, graduates will be able to

- Illustrate several sub-quadratic sorting algorithms.
- Demonstrate recursive methods
- Apply advanced data structures such as balanced search trees, hash tables, priority queues and the disjoint set union/find data structure

UNIT I

Sorting: Medians and order statistics, External Sorting, Introduction, K-way Merging, Buffer Handling for parallel Operation, Run Generation, Optimal Merging of Runs.

Hashing: Introduction, Static Hashing, Hash Table, Hash Functions, Secure Hash Function, Overflow Handling, Theoretical Evaluation of Overflow Techniques, Dynamic Hashing- Motivation for Dynamic Hashing, Dynamic Hashing Using Directories, Directory less Dynamic Hashing, Alternate hash functions (mid-square, folding, digit analysis), Double Hashing

UNIT II

Priority Queues and Advance Heaps: Double Ended Priority queues, Leftist Trees: Height Biased, Weight Biased. Binomial Heaps: Cost Amortization, Definition of Binomial Heaps, Insertion, Melding two Binomial Heaps, deletion of min element. Fibonacci Heaps: Definition, Deletion from an F-heap, Decrease key, Cascading Cut.

UNIT III

Advanced and Efficient Binary Search Trees: Optimal Binary Search Trees, AVL Trees- rotations, insertion, deletion operations, Red-Black Trees, Definition, Representation of a Red-Black Tree, Searching a Red-Black Tree, Inserting into a Red Black Tree, Deletion from a Red-Black Tree, Joining Red-Black Trees, Splitting a Red-Black tree.

UNIT IV

Multi-way Search Trees: M-Way Search Trees, Definition and Properties, Searching an M-Way Search Tree, B-Trees, Definition and Properties, Number of Elements in a B-tree, Insertion into B-Tree, Deletion from a B-Tree, B+-Tree Definition, Searching a B+-Tree, Insertion into B+-tree, Deletion from a B+-Tree.

UNIT V

Digital Search Structures: Digital Search Trees: Definition, Search, Insert and Delete. Binary Tries, Compressed Binary Tries. Multi-way Tries: Definition, searching a Trie, sampling



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strategies, Insertion, Deletion, Height of a Trie. Prefix Search and applications. Suffix Trees.

Text Books:

- 1) Fundamentals of DATA STRUCTURES in C: 2nd ed, , Horowitz , Sahani, Anderson-freed, Universities Press
- 2) Data Structures, a Pseudo code Approach, Richard F Gilberg, Behrouz A Forouzan, Cengage.

Reference Books:

- 1) Data structures and Algorithm Analysis in C, 2nd edition, Mark Allen Weiss, Pearson
- 2) “Introduction to Algorithms”, T. Cormen, R.Rivest, C. Stein, C. Leiserson, PHI publication, Second Edition, 2004, ISBN 81-203-2141-3.

e-Resources:

- 1) Web : <http://lcm.csa.iisc.ernet.in/dsa/dsa.html>
- 2) http://utubersity.com/?page_id=878
- 3) <http://freevidelectures.com/Course/2519/C-Programming-and-Data-Structures>
- 4) <http://freevidelectures.com/Course/2279/Data-Structures-And-Algorithms>



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III Year – I Semester		L	T	P	C
		3	0	0	3
SOFTWARE TESTING METHODOLOGIES					

Course Objectives:

- To study fundamental concepts in software testing and discuss various software testing issues and solutions in software unit, integration, regression and system testing
- To learn how to plan a test project, design test cases and data, conduct testing, manage software problems and defects, generate a test report
- To expose the advanced software testing concepts such as object-oriented software testing methods, web-based and component-based software testing
- To understand software test automation problems and solutions
- To learn how to write software test documents and communicate with engineers in various forms

Course Outcomes:

By the end of the course, the student should have the ability to:

- Identify and understand various software testing problems, apply software testing knowledge and engineering methods and solve these problems by designing and selecting software test models, criteria, strategies, and methods
- Design and conduct a software test process for a software project
- Analyze the needs of software test automation
- Use various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects
- Basic understanding and knowledge of contemporary issues in software testing, such as component-based, web based and object oriented software testing problems
- Write test cases for given software to test it before delivery to the customer and write test scripts for both desktop and web based applications

UNIT I

Software Testing: Introduction, Evolution, Myths & Facts, Goals, Psychology, definition, Model for testing, Effective Vs Exhaustive Software Testing.

Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle, Software Testing Methodology.

Verification and Validation: Verification & Validation Activities, Verification, Verification of Requirements, High level and low level designs, verifying code, Validation.

UNIT II

Dynamic Testing-Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing, Error guessing.

White-Box Testing: need, Logic Coverage criteria, Basis Path testing, Graph matrices, Loop testing, data flow testing, mutation testing.

UNIT III

Static Testing: Inspections, Structured Walkthroughs, Technical Reviews.

Validation activities: Unit testing, Integration Testing, Function testing, system testing, acceptance testing.

Regression testing: Progressives Vs regressive testing, Regression test ability, Objectives of regression testing, Regression testing types, Regression testing techniques.



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UNIT IV

Efficient Test Suite Management: growing nature of test suite, Minimizing the test suite and its benefits, test suite prioritization, Types of test case prioritization, prioritization techniques, measuring the effectiveness of a prioritized test suite
Software Quality Management: Software Quality metrics, SQA models.
Debugging: process, techniques, correcting bugs.

UNIT V

Automation and Testing Tools: need for automation, categorization of testing tools, selection of testing tools, Cost incurred, Guidelines for automated testing, overview of some commercial testing tools such as Win Runner, Load Runner, Jmeter and JUnit . Test Automation using Selenium tool.

Testing Object Oriented Software: basics, Object oriented testing
Testing Web based Systems: Challenges in testing for web based software, quality aspects, web engineering, testing of web based systems, Testing mobile systems.

Text Books:

- 1) Software Testing, Principles and Practices, Naresh Chauhan, Oxford
- 2) Software Testing, Yogesh Singh, CAMBRIDGE

Reference Books:

- 1) Foundations of Software testing, Aditya P Mathur, 2ed, Pearson
- 2) Software testing techniques – Baris Beizer, Dreamtech, second edition.
- 3) Software Testing, Principles, techniques and Tools, M G Limaye, TMH
- 4) Effective Methods for Software testing, Willian E Perry, 3ed, Wiley

e-Resources:

- 1) https://www.tutorialspoint.com/software_testing_dictionary/test_tools.htm



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester	L	T	P	C
	3	0	0	3
ADVANCED COMPUTER ARCHITECTURE				

Course Objectives:

- Understand the Concept of Parallel Processing and its applications
- Implement the Hardware for Arithmetic Operations
- Analyze the performance of different scalar Computers
- Develop the Pipelining Concept for a given set of Instructions
- Distinguish the performance of pipelining and non pipelining environment in a processor

Course Outcomes:

After the completion of the course, student will be able to

- Illustrate the types of computers, and new trends and developments in computer architecture
- Outline pipelining, instruction set architectures, memory addressing
- Apply ILP using dynamic scheduling, multiple issue, and speculation
- Illustrate the various techniques to enhance a processors ability to exploit Instruction-level parallelism (ILP), and its challenges
- Apply multithreading by using ILP and supporting thread-level parallelism (TLP)

UNIT I

Computer Abstractions and Technology: Introduction, Eight Great Ideas in Computer Architecture, Below Your Program, Under the Covers, Technologies for Building Processors and Memory, Performance, The Power Wall, The Sea Change: The Switch from Uni-processors to Multiprocessors, Benchmarking the Intel Core i7, Fallacies and Pitfalls.

UNIT II

Instructions: Language of the Computer: Operations of the Computer Hardware, Operands of the Computer Hardware, Signed and Unsigned Numbers, Representing Instructions in the Computer, Logical Operations, Instructions for Making Decisions, Supporting Procedures in Computer Hardware, Communicating with People, MIPS Addressing for 32-Bit Immediates and Addresses, Parallelism and Instructions: Synchronization, Translating and Starting a Program, A C Sort Example to Put It All Together, Arrays versus Pointers, ARMv7 (32-bit) Instructions, x86 Instructions, ARMv8 (64-bit) Instructions.

UNIT III

Arithmetic for Computers: Introduction, Addition and Subtraction, Multiplication, Division, Floating Point, Parallelism and Computer Arithmetic: Subword Parallelism, Streaming SIMD Extensions and Advanced Vector Extensions in x86, Subword Parallelism and Matrix Multiply.

UNIT IV

The Processor: Introduction, Logic Design Conventions, Building a Datapath, A Simple Implementation Scheme, An Overview of Pipelining, Pipelined Datapath and Control, Data Hazards: Forwarding versus Stalling, Control Hazards, Exceptions, Parallelism via Instructions, The ARM Cortex-A8 and Intel Core i7 Pipelines.



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UNIT V

Large and Fast: Exploiting Memory Hierarchy: Introduction, Memory Technologies, The Basics of Caches, Measuring and Improving Cache Performance, Dependable Memory Hierarchy, Virtual Machines, Virtual Memory, A Common Framework for Memory Hierarchy, Using a Finite-State Machine to Control a Simple Cache, Parallelism and Memory Hierarchies: Cache Coherence, Parallelism and Memory Hierarchy: Redundant Arrays of Inexpensive Disks, Advanced Material: Implementing Cache Controllers, The ARM Cortex-A8 and Intel Core i7 Memory Hierarchies.

Text Books:

- 1) Computer Organization and Design: The hardware and Software Interface, David A Patterson, John L Hennessy, 5th edition, MK.
- 2) Computer Architecture and Parallel Processing – Kai Hwang, Faye A.Brigs, Mc Graw Hill.

Reference Books:

- 1) Modern Processor Design: Fundamentals of Super Scalar Processors, John P. Shen and Miikko H. Lipasti, Mc Graw Hill.
- 2) Advanced Computer Architecture – A Design Space Approach – Dezso Sima, Terence Fountain, Peter Kacsuk , Pearson.

e-Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105163/>



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – I Semester		L	T	P	C
		0	0	2	1
COMPUTER NETWORKS LAB					

Course Objectives:

- Understand and apply different network commands
- Analyze different networking functions and features for implementing optimal solutions
Apply different networking concepts for implementing network solution
- Implement different network protocols

Course Outcomes:

- Apply the basics of Physical layer in real time applications
- Apply data link layer concepts, design issues, and protocols
- Apply Network layer routing protocols and IP addressing
- Implement the functions of Application layer and Presentation layer paradigms and Protocols

Experiments:

- 1) Implement the data link layer framing methods such as character stuffing and bit stuffing.
- 2) Write a C program to develop a DNS client server to resolve the given hostname.
- 3) Implement on a data set of characters the three CRC polynomials – CRC-12, CRC-16 and CRC-CCIP.
- 4) Implement Dijkstra’s algorithm to compute the Shortest path in a graph.
- 5) Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table art each node using distance vector routing algorithm
- 6) Take an example subnet of hosts. Obtain broadcast tree for it.
- 7) Write a client-server application for chat using UDP
- 8) Implement programs using raw sockets (like packet capturing and filtering)
- 9) Write a C program to perform sliding window protocol.
- 10) Get the MAC or Physical address of the system using Address Resolution Protocol.
- 11) Simulate the Implementing Routing Protocols using border gateway protocol(BGP)
- 12) Simulate the OPEN SHORTEST PATH FIRST routing protocol based on the cost assigned to the path.



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III Year – I Semester		L	T	P	C
		0	0	3	1.5
AI TOOLS & TECHNIQUES LAB					

Course Objectives:

- Study the concepts of Artificial Intelligence
- Learn the methods of solving problems using Artificial Intelligence
- Introduce the concepts of machine learning

Course Outcomes:

At the end of the course, the students will be able to:

- Identify problems that are amenable to solution by AI methods
- Identify appropriate AI methods to solve a given problem
- Use language/framework of different AI methods for solving problems
- Implement basic AI algorithms
- Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports

Experiments:

- 1) Study of Prolog.
- 2) Write simple fact for the statements using PROLOG.
- 3) Write predicates One converts centigrade temperatures to Fahrenheit, the other checks if a temperature is below freezing
- 4) Write a program to solve the Monkey Banana problem.
- 5) Write a program in turbo prolog for medical diagnosis and show the advantage and disadvantage of green and red cuts
- 6) Write a program to implement factorial, Fibonacci of a given number
- 7) Write a program to solve 4-Queen and 8-puzzle problem.
- 8) Write a program to solve traveling salesman problem.
- 9) Write a program to solve water jug problem using LISP
- 10) Implementation of A* Algorithm using LISP /PROLOG
- 11) Implementation of Hill Climbing Algorithm using LISP /PROLOG
- 12) Implementation of DFS and BFS for water jug problem using LISP /PROLOG
- 13) Implementation of Towers of Hanoi Problem using LISP /PROLOG



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III Year – I Semester		L	T	P	C
		0	0	3	1.5
DATA MINING LAB					

Course Objectives:

- To understand the mathematical basics quickly and covers each and every condition of data mining in order to prepare for real-world problems
- The various classes of algorithms will be covered to give a foundation to further apply knowledge to dive deeper into the different flavors of algorithms
- Students should aware of packages and libraries of R and also familiar with functions used in R for visualization
- To enable students to use R to conduct analytics on large real life datasets
- To familiarize students with how various statistics like mean median etc and data can be collected for data exploration in R

Course Outcomes: At the end of the course, student will be able to

- Extend the functionality of R by using add-on packages
- Examine data from files and other sources and perform various data manipulation tasks on them
- Code statistical functions in R
- Use R Graphics and Tables to visualize results of various statistical operations on data
- Apply the knowledge of R gained to data Analytics for real life applications

List of Experiments:

- 1) Implement all basic R commands.
- 2) Interact data through .csv files (Import from and export to .csv files).
- 3) Get and Clean data using swirl exercises. (Use 'swirl' package, library and install that topic from swirl).
- 4) Visualize all Statistical measures (Mean, Mode, Median, Range, Inter Quartile Range etc., using Histograms, Boxplots and Scatter Plots).
- 5) Create a data frame with the following structure.

EMP ID	EMP NAME	SALARY	START DATE
1	Satish	5000	01-11-2013
2	Vani	7500	05-06-2011
3	Ramesh	10000	21-09-1999
4	Praveen	9500	13-09-2005
5	Pallavi	4500	23-10-2000

- a. Extract two column names using column name.
 - b. Extract the first two rows and then all columns.
 - c. Extract 3rd and 5th row with 2nd and 4th column.
- 6) Write R Program using 'apply' group of functions to create and apply normalization function on each of the numeric variables/columns of iris dataset to transform them into
 - i. 0 to 1 range with min-max normalization.
 - ii. a value around 0 with z-score normalization.



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- 7) Create a data frame with 10 observations and 3 variables and add new rows and columns to it using 'rbind' and 'cbind' function.
- 8) Write R program to implement linear and multiple regression on 'mtcars' dataset to estimate the value of 'mpg' variable, with best R^2 and plot the original values in 'green' and predicted values in 'red'.
- 9) Implement k-means clustering using R.
- 10) Implement k-medoids clustering using R.
- 11) implement density based clustering on iris dataset.
- 12) implement decision trees using 'readingSkills' dataset.
- 13) Implement decision trees using 'iris' dataset using package party and 'rpart'.
- 14) Use a Corpus() function to create a data corpus then Build a term Matrix and Reveal word frequencies.

Text Books:

- 1) R and Data Mining: Examples and Case Studies, 1st ed, Yanchang Zhao, Springer, 2012.
- 2) R for Everyone, Advanced Analytics and Graphics, 2nd ed, Jared Lander, Pearson, 2018.

e-Resources:

- 1) www.r-tutor.com



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III Year – I Semester		L	T	P	C
		2	0	0	0
EMPLOYABILITY SKILLS -II					

Course Objectives:

The main of this course is

- To learn how to make effective presentations and impressive interviews
- To learn skills for discussing and resolving problems on the work site
- To assess and improve personal grooming
- To promote safety awareness including rules and procedures on the work site
- To develop and practice self management skills for the work site

Course Outcomes:

By the end of this course, the student

- Recite the corporate etiquette.
- Make presentations effectively with appropriate body language
- Be composed with positive attitude
- Apply their core competencies to succeed in professional and personal life

A list of vital employability skills from the standpoint of engineering students with discussion how to potentially develop such skills through campus life.

- 1) Interview Skills: Interviewer and Interviewee – in-depth perspectives. Before, During and After the Interview. Tips for Success.
- 2) Presentation Skills: Types, Content, Audience Analysis, Essential Tips – Before, During and After, Overcoming Nervousness.
- 3) Etiquette and Manners – Social and Business.
- 4) Time Management – Concept, Essentials, Tips.
- 5) Personality Development – Meaning, Nature, Features, Stages, Models; Learning Skills; Adaptability Skills.
- 6) Decision-Making and Problem-Solving Skills: Meaning, Types and Models, Group and Ethical Decision-Making, Problems and Dilemmas in application of these skills.
- 7) Conflict Management: Conflict - Definition, Nature, Types and Causes; Methods of Conflict Resolution.
- 8) Stress Management: Stress - Definition, Nature, Types, Symptoms and Causes; Stress Analysis Models and Impact of Stress; Measurement and Management of Stress
- 9) Leadership and Assertiveness Skills: A Good Leader; Leaders and Managers; Leadership Theories; Types of Leaders; Leadership Behaviour; Assertiveness Skills.
- 10) Emotional Intelligence: Meaning, History, Features, Components, Intrapersonal and Management Excellence; Strategies to enhance Emotional Intelligence.

Reference Books:

- 1) Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
- 2) S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.
- 3) R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.
- 4) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.



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- 5) Managing Soft Skills for Personality Development – edited by B.N.Ghosh, McGraw Hill India, 2012.
- 6) English and Soft Skills – S.P.Dhanavel, Orient Blackswan India, 2010.



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III Year – II Semester		L	T	P	C
		3	0	0	3
WEB TECHNOLOGIES					

Course Objectives:

From the course the student will learn

- Translate user requirements into the overall architecture and implementation of new systems and Manage Project and coordinate with the Client
- Write backend code in PHP language and Writing optimized front end code HTML and JavaScript
- Understand, create and debug database related queries and Create test code to validate the applications against client requirement
- Monitor the performance of web applications & infrastructure and Troubleshooting web application with a fast and accurate a resolution

Course Outcomes:

- Illustrate the basic concepts of HTML and CSS & apply those concepts to design static web pages
- Identify and understand various concepts related to dynamic web pages and validate them using JavaScript
- Outline the concepts of Extensible markup language & AJAX
- Develop web Applications using Scripting Languages & Frameworks
- Create and deploy secure, usable database driven web applications using PHP and RUBY

UNIT I

HTML: Basic Syntax, Standard HTML Document Structure, Basic Text Markup, Html styles, Elements, Attributes, Heading, Layouts, Html media, Iframes Images, Hypertext Links, Lists, Tables, Forms, GET and POST method, HTML 5, Dynamic HTML.

CSS: Cascading style sheets, Levels of Style Sheets, Style Specification Formats, Selector Forms, The Box Model, Conflict Resolution, CSS3.

UNIT II

Javascript - Introduction to Javascript, Objects, Primitives Operations and Expressions, Control Statements, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions, Fundamentals of Angular JS and NODE JS Angular Java Script- Introduction to Angular JS Expressions: ARRAY, Objects, Strings, Angular JS Form Validation & Form Submission.

Node.js- Introduction, Advantages, Node.js Process Model, Node JS Modules, Node JS File system, Node JS URL module, Node JS Events.

UNIT III

Working with XML: Document type Definition (DTD), XML schemas, XSLT, Document object model, Parsers - DOM and SAX.

AJAX A New Approach: Introduction to AJAX, Basics of AJAX, XML Http Request Object, AJAX UI tags, Integrating PHP and AJAX.

UNIT IV

PHP Programming: Introduction to PHP, Creating PHP script, Running PHP script. Working with variables and constants: Using variables, Using constants, Data types, Operators. Controlling program flow: Conditional statements, Control statements, Arrays, functions.



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UNIT V

Web Servers- IIS (XAMPP, LAMP) and Tomcat Servers. Java Web Technologies-Introduction to Servlet, Life cycle of Servlet, Servlet methods, Java Server Pages.

Database connectivity – Servlets, JSP, PHP, Practice of SQL Queries.

Introduction to Mongo DB and JQuery.

Web development frameworks – Introduction to Ruby, Ruby Scripting, Ruby on rails –Design, Implementation and Maintenance aspects.

Text Books:

- 1) Programming the World Wide Web, 7th Edition, Robert W Sebesta, Pearson, 2013.
- 2) Web Technologies, 1st Edition 7th impression, Uttam K Roy, Oxford, 2012.
- 3) Pro Mean Stack Development, 1st Edition, ELad Elrom, Apress O'Reilly, 2016
- 4) Java Script & jQuery the missing manual, 2nd Edition, David sawyer mcfarland, O'Reilly, 2011.
- 5) Web Hosting for Dummies, 1st Edition, Peter Pollock, John Wiley & Sons, 2013.
- 6) RESTful web services, 1st Edition, Leonard Richardson, Ruby, O'Reilly, 2007.

Reference Books:

- 1) Ruby on Rails Up and Running, Lightning fast Web development, 1st Edition, Bruce Tate, Curt Hibbs, Oreilly, 2006.
- 2) Programming Perl, 4th Edition, Tom Christiansen, Jonathan Orwant, O'Reilly, 2012.
- 3) Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, 1st Edition, Dream Tech, 2009.
- 4) An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda S Katila, Cengage Learning, 2003.



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III Year – II Semester		L	T	P	C
		3	0	0	3
DISTRIBUTED SYSTEMS					

Course Objectives:

- To understand the foundations of distributed systems.
- To learn issues related to clock Synchronization and the need for global state in distributed systems
- To learn distributed mutual exclusion and deadlock detection algorithms
- To understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems
- To learn the characteristics of peer-to-peer and distributed shared memory systems

Course Outcomes:

At the end of the course, the students will be able to:

- Elucidate the foundations and issues of distributed systems
- Illustrate the various synchronization issues and global state for distributed systems
- Illustrate the Mutual Exclusion and Deadlock detection algorithms in distributed systems
- Describe the agreement protocols and fault tolerance mechanisms in distributed systems
- Describe the features of peer-to-peer and distributed shared memory systems

UNIT I

Distributed Systems: Definition, Relation to computer system components, Motivation, Relation to parallel systems, Message-passing systems versus shared memory systems, Primitives for distributed communication, Synchronous versus asynchronous executions, Design issues and challenges.

A model of distributed computations: A distributed program, A model of distributed executions, Models of communication networks, Global state, Cuts, Past and future cones of an event, Models of process communications.

Logical Time: A framework for a system of logical clocks, Scalar time, Vector time, Physical clock synchronization: NTP.

UNIT II

Message Ordering & Snapshots: Message ordering and group communication: Message ordering paradigms, Asynchronous execution with synchronous communication, Synchronous program order on an asynchronous system, Group communication, Causal order (CO), Total order. Global state and snapshot recording algorithms: Introduction, System model and definitions, Snapshot algorithms for FIFO channels.

UNIT III

Distributed Mutex & Deadlock: Distributed mutual exclusion algorithms: Introduction – Preliminaries – Lamport’s algorithm – Ricart-Agrawala algorithm – Maekawa’s algorithm – Suzuki-Kasami’s broadcast algorithm. Deadlock detection in distributed systems: Introduction – System model – Preliminaries – Models of deadlocks – Knapp’s classification – Algorithms for the single resource model, the AND model and the OR model.

UNIT IV

Recovery & Consensus: Check pointing and rollback recovery: Introduction – Background and definitions – Issues in failure recovery – Checkpoint-based recovery – Log-based rollback



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recovery – Coordinated check pointing algorithm – Algorithm for asynchronous check pointing and recovery. Consensus and agreement algorithms: Problem definition – Overview of results – Agreement in a failure – free system – Agreement in synchronous systems with failures.

UNIT V

Peer-to-peer computing and overlay graphs: Introduction – Data indexing and overlays – Chord – Content addressable networks – Tapestry.

Distributed shared memory: Abstraction and advantages – Memory consistency models –Shared memory Mutual Exclusion.

Text Books:

- 1) Distributed Systems Concepts and Design, George Coulouris, Jean Dollimore and Tim Kindberg, Fifth Edition, Pearson Education, 2012.
- 2) Distributed computing: Principles, algorithms, and systems, Ajay D Kshemkalyani and Mukesh Singhal, Cambridge University Press, 2011.

Reference Books:

- 1) Distributed Operating Systems: Concepts and Design, Pradeep K Sinha, Prentice Hall of India, 2007.
- 2) Advanced concepts in operating systems. Mukesh Singhal and Niranjan G. Shivaratri, McGraw-Hill, 1994.
- 3) Distributed Systems: Principles and Paradigms, Tanenbaum A.S., Van Steen M., Pearson Education, 2007.

e-Resources:

- 1) <https://nptel.ac.in/courses/106/106/106106168/>



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III Year – II Semester		L	T	P	C
		3	0	0	3
DESIGN AND ANALYSIS OF ALGORITHMS					

Course Objectives:

- To provide an introduction to formalisms to understand, analyze and denote time complexities of algorithms
- To introduce the different algorithmic approaches for problem solving through numerous example problems
- To provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness

Course Outcomes:

- Describe asymptotic notation used for denoting performance of algorithms
- Analyze the performance of a given algorithm and denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms
- List and describe various algorithmic approaches
- Solve problems using divide and conquer, greedy, dynamic programming, backtracking and branch and bound algorithmic approaches
- Apply graph search algorithms to real world problems
- Demonstrate an understanding of NP- Completeness theory and lower bound theory

UNIT I

Introduction: Algorithm Definition, Algorithm Specification, performance Analysis, Performance measurement, Asymptotic notation, Randomized Algorithms.

Sets & Disjoint set union: introduction, union and find operations.

Basic Traversal & Search Techniques: Techniques for Graphs, connected components and Spanning Trees, Bi-connected components and DFS.

UNIT II

Divide and Conquer: General Method, Defective chessboard, Binary Search, finding the maximum and minimum, Merge sort, Quick sort.

The Greedy Method: The general Method, container loading, knapsack problem, Job sequencing with deadlines, minimum-cost spanning Trees.

UNIT III

Dynamic Programming: The general method, multistage graphs, All pairs-shortest paths, single-source shortest paths: general weights, optimal Binary search trees, 0/1 knapsack, reliability Design, The traveling salesperson problem, matrix chain multiplication.

UNIT IV

Backtracking: The General Method, The 8-Queens problem, sum of subsets, Graph coloring, Hamiltonian cycles, knapsack problem.

Branch and Bound: FIFO Branch-and-Bound, LC Branch-and-Bound, 0/1 Knapsack problem, Traveling salesperson problem.

UNIT V

NP-Hard and NP-Complete problems: Basic concepts, Cook's Theorem.

String Matching: Introduction, String Matching-Meaning and Application, Naïve String Matching Algorithm, Rabin-Karp Algorithm, Knuth-Morris-Pratt Automata, Tries, Suffix Tree.



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Text Books:

- 1) Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, “ Fundamentals of Computer Algorithms”, 2nd Edition, Universities Press.
- 2) Harsh Bhasin, “ Algorithms Design & Analysis”, Oxford University Press.

Reference Books:

- 1) Horowitz E. Sahani S: “Fundamentals of Computer Algorithms”, 2nd Edition, Galgotia Publications, 2008.
- 2) S. Sridhar, “Design and Analysis of Algorithms”, Oxford University Press.

e-Resources:

- 1) <http://nptel.ac.in/courses/106101060/>



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III Year – II Semester		L	T	P	C
		3	0	0	3
PROFESSIONAL ELECTIVE -II					

(NPTEL/SWAYAM) Course

Duration: 12 Weeks Minimum

***Course/subject title can't be repeated**

12 Weeks NPTEL Courses by NPTEL/SWAYAM courses

- 1) Introduction to Industry 4.0 and Industrial Internet of Things
- 2) AI: Knowledge Representation and Reasoning
- 3) Synthesis of Digital Systems
- 4) Privacy and Security in Online Social Media
- 5) Block chain architecture design and use cases
- 6) Machine Learning for Engineering and Science Applications
- 7) Randomized Algorithms
- 8) Parallel Algorithms
- 9) Hardware Security

Note: The courses listed here are just few examples. The student can take courses offered in CSE discipline which are 12 weeks minimum duration.



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III Year – II Semester		L	T	P	C
		3	0	0	3
OPEN ELECTIVE -I					

Note: The student has to take any one **open elective course** offered in the other departments (or) SWAYAM/NPTEL courses offered by other than parent department. (12 week minimum).
 Given below are some of the courses offered by NPTEL/SWAYAM

<p>Electronics & Communication Engineering</p> <ol style="list-style-type: none"> 1) Information Coding Theory 2) VLSI Design 3) Signals & Systems 4) Digital Signal Processing 	<p>Mathematics</p> <ol style="list-style-type: none"> 1) Optimization Techniques 2) Computational Number Theory and Cryptography
<p>Electrical and Electronics Engineering</p> <ol style="list-style-type: none"> 1) Networking Analysis 2) Fuzzy Sets, Logic and Systems & Applications 3) Energy Management Systems and SCADA 4) Industrial Safety Engineering 	<p>Civil Engineering</p> <ol style="list-style-type: none"> 1) Intelligent transportation engineering 2) Remote Sensing and GIS 3) Engineering Mechanics 4) City and Metropolitan Planning 5) Sustainable Materials and Green Buildings
<p>Mechanical Engineering</p> <ol style="list-style-type: none"> 1) Industrial Automation and Control 2) Robotics 3) CAD 4) Mechatronics And Manufacturing Automation 5) Non Conventional Energy Resources 	



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III Year – II Semester	L	T	P	C
	3	0	0	3
MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTANCY				

Course Objectives:

- The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting.
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis.
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles.
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation.
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals.

Unit-I

Introduction to Managerial Economics and demand Analysis:

Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

Unit – II:

Theories of Production and Cost Analyses:

Theories of Production function- Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

Unit – III:

Introduction to Markets, Theories of the Firm & Pricing Policies:

Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson’s models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles : Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms.

Unit – IV:

Introduction to Accounting & Financing Analysis:

Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis (Problems)

Unit – V:

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(pay back period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)



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Course Outcomes:

- The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product.
- The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs.
- The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.
- The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis.
- The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

TEXT BOOKS:

A R Aryasri, Managerial Economics and Financial Analysis, The McGraw – Hill companies.

REFERENCES:

1. Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & Company Ltd,
2. JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition edition
3. N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & Company Ltd,
4. MaheswariS.N,AnIntroduction to Accountancy, Vikas Publishing House Pvt Ltd
5. I.M Pandey, Financial Management , Vikas Publishing House Pvt Ltd
6. V. Maheswari, Managerial Economics, S. Chand & Company Ltd,



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

III Year – II Semester		L	T	P	C
		0	0	4	2
WEB TECHNOLOGIES LAB					

Course Objectives:

From the course the student will

- Learn the core concepts of both the frontend and backend programming course
- Get familiar with the latest web development technologies
- Learn all about PHP and SQL databases
- Learn complete web development process

Course Outcomes:

By the end of the course the student will be able to

- Analyze and apply the role of languages like HTML, CSS, XML
- Review JavaScript, PHP and protocols in the workings of the web and web applications
- Apply Web Application Terminologies, Internet Tools, E – Commerce and other web services
- Develop and Analyze dynamic Web Applications using PHP & MySql
- Install & Use Frameworks

List of Experiments:

- 1) Design the following static web pages required for an online book store web site:

(a) **HOME PAGE:**

The static home page must contain three **frames**.

Top frame: Logo and the college name and links to Home page, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below).

Left frame: At least four links for navigation, which will display the catalogue of respective links.

For e.g.: When you click the link “MCA” the catalogue for MCA Books should be displayed in the Right frame.

Right frame: The *pages to the links in the left frame must be loaded here*. Initially this page contains description of the web site.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
mca mba BCA	Description of the Web Site			



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(b) LOGIN PAGE:

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
MCA MBA BCA	Login : <input type="text" value="11a51f0003"/> Password: <input type="password" value="*****"/> <input type="button" value="Submit"/> <input type="button" value="Reset"/>			

(c) CATALOGUE PAGE:

The catalogue page should contain the details of all the books available in the web site in a table: The details should contain the following:

1. Snap shot of Cover Page.
2. Author Name.
3. Publisher.
4. Price.
5. Add to cart button.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
MCA		Book : XML Bible Author : Winston Publication : Wiley	\$ 40.5	<input type="button" value="Add to cart"/>
MBA		Book : AI Author : S.Russel Publication : Princeton hall	\$ 63	<input type="button" value="Add to cart"/>
BCA		Book : Java 2 Author : Watson Publication : BPB publications	\$ 35.5	<input type="button" value="Add to cart"/>
		Book : HTML in 24 hours Author : Sam Peter Publication : Sam	\$ 50	<input type="button" value="Add to cart"/>

(d). REGISTRATION PAGE:

Create a “registration form “with the following fields

- 1) Name (Text field)
- 2) Password (password field)
- 3) E-mail id (text field)
- 4) Phone number (text field)
- 5) Sex (radio button)
- 6) Date of birth (3 select boxes)
- 7) Languages known (check boxes – English, Telugu, Hindi, Tamil)
- 8) Address (text area)

- 2) Design a web page using CSS (Cascading Style Sheets) which includes the following: Use different font, styles:

In the style definition you define how each selector should work (font, color etc.).



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Then, in the body of your pages, you refer to these selectors to activate the styles

- 3) Design a dynamic web page with validation using JavaScript.
- 4) Design a HTML having a text box and four buttons viz Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate javascript function should be called to display
 - a. Factorial of that number
 - b. Fibonacci series up to that number
 - c. Prime numbers up to that number
 - d. Is it palindrome or not
- 5) Write JavaScript programs on Event Handling
 - a. Validation of registration form
 - b. Open a Window from the current window
 - c. Change color of background at each click of button or refresh of a page
 - d. Display calendar for the month and year selected from combo box
 - e. On Mouse over event
- 6) Write an XML file which will display the Book information which includes the following:
 - 1) Title of the book
 - 2) Author Name
 - 3) ISBN number
 - 4) Publisher name
 - 5) Edition
 - 6) Price
 - a) Write a Document Type Definition (DTD) to validate the above XML file.
 - b) Write a XML Schema Definition (XSD) to validate the above XML file.
- 7) Create Web pages using AJAX.
- 8) User Authentication:

Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a PHP for doing the following.

 1. Create a Cookie and add these four user id's and passwords to this Cookie.
 2. Read the user id and passwords entered in the Login form (week1) and authenticate with the values (user id and passwords) available in the cookies.

If he is a valid user (i.e., user-name and password match) you should welcome him by name (user-name) else you should display "You are not an authenticated user".

Use init-parameters to do this.
- 9) Example PHP program for registering users of a website and login.
- 10) Install a database (Mysql or Oracle).

Create a table which should contain at least the following fields: name, password, email-id, phone number (these should hold the data from the registration form).

Write a PHP program to connect to that database and extract data from the tables and display them. Experiment with various SQL queries.

Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page (week2).
- 11) Write a PHP which does the following job:

Insert the details of the 3 or 4 users who register with the web site (week9) by using



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registration form. Authenticate the user when he submits the login form using the user name and password from the database (similar to week8 instead of cookies).

- 12) Implement a Servlet program on request response processing.
- 13) Implement a Servlet program for Registration Page.
- 14) Connect to a database using JSP and practice SQL Queries (MySql or Oracle).



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III Year – II Semester	L	T	P	C
	0	0	0	1
Industrial Training / Skill Development Programmes / Research Project in higher learning institutes				

Note: The Industrial Training / Skill Development Programmes / Research Project in higher learning institutes should be taken during the semester gap between II B.Tech-II Semester and III B.Tech-I Semester for a period of 4 weeks.



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IV Year –I Semester		L	T	P	C
		3	0	0	3
CRYPTOGRAPHY AND NETWORK SECURITY					

Course Objectives:

This course aims at training students to master the:

- The concepts of classical encryption techniques and concepts of finite fields and number theory
- Working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms
- Design issues and working principles of various authentication protocols, PKI standards
- Various secure communication standards including Kerberos, IPsec, and SSL/TLS and email
- Concepts of cryptographic utilities and authentication mechanisms to design secure applications

Course Outcomes:

By the end of the course the student

- Identify information security goals, classical encryption techniques and acquire fundamental knowledge on the concepts of finite fields and number theory
- Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication
- Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.
- Apply different digital signature algorithms to achieve authentication and create secure applications
- Apply network security basics, analyze different attacks on networks and evaluate the performance of firewalls and security protocols like SSL, IPSec, and PGP
- Apply the knowledge of cryptographic utilities and authentication mechanisms to design secure applications

UNIT I

Classical Encryption Techniques: Security Attacks, Services & Mechanisms, Symmetric Cipher Model. Cyber Threats, Phishing Attack, Web Based Attacks, SQL Injection Attacks, Buffer Overflow & Format String Vulnerabilities, TCP session hijacking, UDP Session Hijacking. Block Ciphers: Traditional Block Cipher Structure, Block Cipher Design Principles.

UNIT II

Symmetric Key Cryptography: Data Encryption Standard (DES), Advanced Encryption Standard (AES), Blowfish, IDEA, Block Cipher Modes of Operations.
 Number Theory: Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems, The Chinese Remainder Theorem, Discrete Logarithms.

UNIT III

Public Key Cryptography: Principles, Public Key Cryptography Algorithms, RSA Algorithm, Diffie Hellman Key Exchange, Elliptic Curve Cryptography.

Cryptographic Hash Functions: Application of Cryptographic Hash Functions, Requirements & Security, Secure Hash Algorithm, Message Authentication Functions, Requirements & Security, HMAC & CMAC.

Digital Signatures: NIST Digital Signature Algorithm, Key Management and Distribution



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UNIT IV

User Authentication: Remote User Authentication Principles, Kerberos.

Electronic Mail Security: Pretty Good Privacy (PGP) And S/MIME.

IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

UNIT V

Transport Level Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Shell (SSH)

Firewalls: Characteristics, Types of Firewalls, Placement of Firewalls, Firewall Configuration, Trusted Systems.

Text Books:

- 1) Cryptography and Network Security- William Stallings, Pearson Education, 7th Edition.
- 2) Cryptography, Network Security and Cyber Laws – Bernard Menezes, Cengage Learning, 2010 edition.

Reference Books:

- 1) Cryptography and Network Security- Behrouz A Forouzan, Debdeep Mukhopadhyaya, Mc-GrawHill, 3rd Edition, 2015.
- 2) Network Security Illustrated, Jason Albanese and Wes Sonnenreich, MGH Publishers, 2003.

e-Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105031/> lecture by Dr. Debdeep Mukhopadhyay IIT Kharagpur [Video Lecture]
- 2) <https://nptel.ac.in/courses/106/105/106105162/> lecture by Dr. Sourav Mukhopadhyay IIT Kharagpur [Video Lecture]
- 3) <https://www.mitel.com/articles/web-communication-cryptography-and-network-security> web articles by Mitel Power Connections



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IV Year –I Semester	L	T	P	C
	3	0	0	3
UML & DESIGN PATTERNS				

Course Objectives:

- To understand the fundamentals of object modeling
- To understand and differentiate Unified Process from other approaches
- To design with static UML diagrams
- To design with the UML dynamic and implementation diagrams
- To improve the software design with design patterns
- To test the software against its requirements specification

Course Outcomes:

At the end of the course, the students will be able to:

- Illustrate software design with UML diagrams
- Design software applications using OO concepts
- Identify various scenarios based on software requirements
- Apply UML based software design into pattern based design using design patterns
- Illustrate the various testing methodologies for OO software

UNIT I

Introduction to UML: Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, Software Development Life Cycle. Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. Advanced classes, advanced relationships, Object diagrams: common modeling techniques.

UNIT II

Behavioral Modeling: Interactions, Interaction diagrams. Use cases, Use case Diagrams, Activity Diagrams, Events and signals, state machines, state chart diagrams.

UNIT III

Advanced Behavioral Modeling: Architectural Modeling: Components, Deployment, Component diagrams and Deployment diagrams, Common modeling techniques for component and deployment diagrams

Design Pattern: Introduction, Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, Using a Design Pattern.

UNIT IV

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton
 Structural Patterns: Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy.

UNIT V

Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, Strategy, Template Method, What to Expect from Design Patterns

Text Books:

- 1) The unified Modeling language user guide by Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson.
- 2) Design Patterns, Erich Gamma, Pearson.



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Reference Books:

- 1) Object Oriented Analysis and Design, Satzinger, CENGAGE

e-Resources:

- 1) https://www.tutorialspoint.com/design_pattern/design_pattern_quick_guide.html



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IV Year –I Semester		L	T	P	C
		3	0	0	3
MACHINE LEARNING					

Course Objectives:

The course is introduced for students to

- Gain knowledge about basic concepts of Machine Learning
- Study about different learning algorithms
- Learn about of evaluation of learning algorithms
- Learn about Dimensionality reduction

Course Outcomes:

- Identify machine learning techniques suitable for a given problem
- Solve the problems using various machine learning techniques
- Apply Dimensionality reduction techniques
- Design application using machine learning techniques

UNIT I

Introduction: Definition of learning systems, Goals and applications of machine learning, Aspects of developing a learning system: training data, concept representation, function approximation.

Inductive Classification: The concept learning task, Concept learning as search through a hypothesis space, General-to-specific ordering of hypotheses, Finding maximally specific hypotheses, Version spaces and the candidate elimination algorithm, Learning conjunctive concepts, The importance of inductive bias.

UNIT II

Decision Tree Learning: Representing concepts as decision trees, Recursive induction of decision trees, Picking the best splitting attribute: entropy and information gain, Searching for simple trees and computational complexity, Occam's razor, Overfitting, noisy data, and pruning. Experimental Evaluation of Learning Algorithms: Measuring the accuracy of learned hypotheses. Comparing learning algorithms: cross-validation, learning curves, and statistical hypothesis testing.

UNIT III

Computational Learning Theory: Models of learnability: learning in the limit; probably approximately correct (PAC) learning. Sample complexity for infinite hypothesis spaces, Vapnik-Chervonenkis dimension.

Rule Learning: Propositional and First-Order, Translating decision trees into rules, Heuristic rule induction using separate and conquer and information gain, First-order Horn-clause induction (Inductive Logic Programming) and Foil, Learning recursive rules, Inverse resolution, Golem, and Progol.

UNIT IV

Artificial Neural Networks: Neurons and biological motivation, Linear threshold units. Perceptrons: representational limitation and gradient descent training, Multilayer networks and backpropagation, Hidden layers and constructing intermediate, distributed representations. Overfitting, learning network structure, recurrent networks.

Support Vector Machines: Maximum margin linear separators. Quadratic programming solution to finding maximum margin separators. Kernels for learning non-linear functions.



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UNIT V

Bayesian Learning: Probability theory and Bayes rule. Naive Bayes learning algorithm. Parameter smoothing. Generative vs. discriminative training. Logistic regression. Bayes nets and Markov nets for representing dependencies.

Instance-Based Learning: Constructing explicit generalizations versus comparing to past specific examples. k-Nearest-neighbor algorithm. Case-based learning.

Text Books:

- 1) T.M. Mitchell, “Machine Learning”, McGraw-Hill, 1997.
- 2) Machine Learning, Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, Pearson, 2019.

Reference Books:

- 1) Ethern Alpaydin, “Introduction to Machine Learning”, MIT Press, 2004.
- 2) Stephen Marsland, “Machine Learning -An Algorithmic Perspective”, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
- 3) Andreas C. Müller and Sarah Guido “Introduction to Machine Learning with Python: A Guide for Data Scientists”, Oreilly.

e-Resources:

- 1) Andrew Ng, “Machine Learning Yearning” <https://www.deeplearning.ai/machine-learning-yearning/>
- 2) Shai Shalev-Shwartz , Shai Ben-David, “Understanding Machine Learning: From Theory to Algorithms” , Cambridge University Press
<https://www.cse.huji.ac.il/~shais/UnderstandingMachineLearning/index.html>



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year –I SEMESTER		L	T	P	C
		3	0	0	3
Open Elective –II					

Note: The student has to take any one **open elective course** offered in the other departments (or) SWAYAM/NPTEL courses offered by other than parent department. (12 week minimum).

Given below are some of the courses offered by NPTEL/SWAYAM

<p>Electronics & Communication Engineering</p> <ol style="list-style-type: none"> 1) Information Coding Theory 2) VLSI Design 3) Signals & Systems 4) Digital Signal Processing 	<p>Mathematics</p> <ol style="list-style-type: none"> 1) Optimization Techniques 2) Computational Number Theory and Cryptography
<p>Electrical and Electronics Engineering</p> <ol style="list-style-type: none"> 1) Networking Analysis 2) Fuzzy Sets, Logic and Systems & Applications 3) Energy Management Systems and SCADA 4) Industrial Safety Engineering 	<p>Civil Engineering</p> <ol style="list-style-type: none"> 1) Intelligent transportation engineering 2) Remote Sensing and GIS 3) Engineering Mechanics 4) City and Metropolitan Planning 5) Sustainable Materials and Green Buildings
<p>Mechanical Engineering</p> <ol style="list-style-type: none"> 1) Industrial Automation and Control 2) Robotics 3) CAD 4) Mechatronics And Manufacturing Automation 5) Non Conventional Energy Resources 	



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year –I Semester	L	T	P	C
	3	0	0	3
MOBILE COMPUTING				

Course Objectives:

- To study the emerging technologies in the context of wireless networks
- To understand the mobile computing environment
- To learn about pervasive computing environment

Course Outcomes:

At the end of the course, student will be able to

- Interpret Wireless local area networks (WLAN): MAC design principles, 802.11 WIFI
- Discuss fundamental challenges in mobile communications and potential Techniques in GSM
- Demonstrate Mobile IP in Network layer
- Elaborate TCP/IP Protocols and database issues
- Illustrate different data delivery methods and synchronization protocols
- Develop applications that are mobile-device specific and demonstrate current Practice in mobile computing contexts

UNIT I

Mobile Communications: An Overview- Mobile Communication-guided transmission, unguided transmission- signal propagation frequencies, antennae, modulation, modulation methods and standards for voice-oriented data communication standards, modulation methods and standards for data and voice communication, mobile computing- novel applications and limitations, mobile computing architecture, mobile system networks. Mobile devices and systems: Cellular networks and frequency reuse, Mobile smart phones, Smart mobiles and systems, handheld pocket computers, Handheld devices, Smart systems, Limitations of mobile devices.

UNIT II

GSM and other 2G Architectures: GSM-services and system architecture, Radio interfaces of GSM, Protocols of GSM, Localization, Call handling, GPRS system architecture. Wireless medium access control, CDMA, 3G, 4G and 5G Communication: Modulation, Multiplexing, Controlling the medium access, Spread spectrum, Coding methods, IMT-2000/3G wireless communication standards, WCDMA 3G communication standards, CDMA 3G communication standards, Broadband wireless access, 4G networks, 5G Networks.

UNIT III

Mobile IP Network layer: IP and Mobile IP network layers: OSI layer functions, TCP/IP and Internet protocol, Mobile internet protocol; Packet delivery and Handover Management; Location Management: Agent Discovery; Mobile TCP Introduction to Mobile Adhoc network: fixed infrastructure architecture, MANET infrastructure architecture; MANET: properties, spectrum, applications; Security in Ad-hoc network; Wireless sensor networks; sensor network applications.

UNIT IV

Synchronization: Synchronization in mobile computing systems, Usage models for Synchronization in mobile application, Domain-dependant specific rules for data synchronization, Personal information manager, synchronization and conflict resolution strategies, synchronizer; Mobile agent: mobile agent design, aglets; Application Server.



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UNIT V

Mobile Wireless Short Range Networks and Mobile Internet: Wireless networking and wireless LAN, Wireless LAN (WLAN) architecture, IEEE 802.11 protocol layers, Wireless application protocol (WAP)-WAP1.1 architecture, wireless datagram protocol (WDP), Wireless Transport Layer Security (WTLS), wireless transaction and session layers, wireless application environment.

Text Books:

- 1) Mobile Computing, 2nd edition, Raj kamal, Oxford, 2011
- 2) Mobile Computing, Technology Applications and Service Creation, 2nd Edition, Asoke K Talukder, Hasanahmed, Roopa R Yavagal, McGraw Hill, 2017

Reference Books:

- 1) "Principles of Mobile Computing," 2nd Edition, UWE Hansmann, Lothar Merk, Martin S. Nocklous, Thomas Stober, Springer. 2003

e-Resources:

- 1) <https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs13/>



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year –I Semester		L	T	P	C
		3	0	0	3
DATA SCIENCE					

Course Objectives:

From the course the student will learn

- Provide you with the knowledge and expertise to become a proficient data scientist
- Demonstrate an understanding of statistics and machine learning concepts that are vital for data science
- Learn to statistically analyze a dataset
- Explain the significance of exploratory data analysis (EDA) in data science
- Critically evaluate data visualizations based on their design and use for communicating stories from data

Course Outcomes:

At the end of the course, student will be able to

- Describe what Data Science is and the skill sets needed to be a data scientist
- Illustrate in basic terms what Statistical Inference means. Identify probability distributions commonly used as foundations for statistical modelling, Fit a model to data
- Use R to carry out basic statistical modeling and analysis
- Apply basic tools (plots, graphs, summary statistics) to carry out EDA
- Describe the Data Science Process and how its components interact
- Use APIs and other tools to scrap the Web and collect data
- Apply EDA and the Data Science process in a case study

UNIT I

Introduction, The Ascendance of Data, Motivating Hypothetical: Data Science, Finding Key Connectors, The Zen of Python, Getting Python, Virtual Environments, Whitespace Formatting, Modules, Functions, Strings, Exceptions, Lists, Tuples, Dictionaries defaultdict, Counters, Sets, Control Flow, Truthiness, Sorting, List Comprehensions, Automated Testing and assert, Object-Oriented Programming, Iterables and Generators, Randomness, Regular Expressions, Functional Programming, zip and Argument Unpacking, args and kwargs, Type Annotations, How to Write Type Annotations.

UNIT II

Visualizing Data: matplotlib, Bar Charts, Line Charts, Scatterplots. Linear Algebra: Vectors, Matrices, Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, Some Other Correlational Caveats, Correlation and Causation.

Gradient Descent: The Idea Behind Gradient Descent, Estimating the Gradient, Using the Gradient, Choosing the Right Step Size, Using Gradient Descent to Fit Models, Minibatch and Stochastic Gradient Descent.

UNIT III

Getting Data: stdin and stdout, Reading Files, Scraping the Web, Using APIs,

Working with Data: Exploring Your Data Using NamedTuples, Dataclasses, Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction.

Probability: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem



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UNIT IV

Machine Learning: Modeling, Overfitting and Underfitting, Correctness, The Bias-Variance Tradeoff, Feature Extraction and Selection, k-Nearest Neighbors, Naive Bayes, Simple Linear Regression, Multiple Regression, Digression, Logistic Regression

UNIT V

Clustering: The Idea, The Model, Choosing k, Bottom-Up Hierarchical Clustering.
Recommender Systems: Manual Curation, Recommending What's Popular, User-Based Collaborative Filtering, Item-Based Collaborative Filtering, Matrix Factorization
Data Ethics, Building Bad Data Products, Trading Off Accuracy and Fairness, Collaboration, Interpretability, Recommendations, Biased Data, Data Protection
IPython, Mathematics, NumPy, pandas, scikit-learn, Visualization, R

Textbooks:

- 1) Joel Grus, "Data Science From Scratch", O'Reilly.
- 2) Allen B. Downey, "Think Stats", O'Reilly.

Reference Books:

- 1) Doing Data Science: Straight Talk From The Frontline, 1st Edition, Cathy O'Neil and Rachel Schutt, O'Reilly, 2013
- 2) Mining of Massive Datasets, 2nd Edition, Jure Leskovek, Anand Rajaraman and Jeffrey Ullman, v2.1, Cambridge University Press, 2014
- 3) "The Art of Data Science", 1st Edition, Roger D. Peng and Elizabeth matsui, Lean Publications, 2015
- 4) "Algorithms for Data Science", 1st Edition, Steele, Brian, Chandler, John, Reddy, Swarna, springers Publications, 2016

e-Resources:

- 1) <https://github.com/joelgrus/data-science-from-scratch>
- 2) <https://github.com/donnemartin/data-science-ipython-notebooks>
- 3) <https://github.com/academic/awesome-datascience>



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IV Year –I Semester		L	T	P	C
		3	0	0	3
NoSQL DATABASES					

Course Objectives:

From the course the student will

- To understand the basic concepts and the applications of database systems. To master the basics of SQL and construct queries using SQL
- To understand the relational database design principles
- To become familiar with the basic issues of transaction processing and concurrency control
- To become familiar with database storage structures and access techniques

Course Outcomes:

After the completion of the course, student will be able to do the following

- Identify what type of NoSQL database to implement based on business requirements (key-value, document, full text, graph, etc.)
- Apply NoSQL data modeling from application specific queries
- Use Atomic Aggregates and denormalization as data modelling techniques to optimize query processing

UNIT I

Introduction to NoSQL: Definition And Introduction, Sorted Ordered Column-Oriented Stores, Key/Value Stores, Document Databases, Graph Databases, Examining Two Simple Examples, Location Preferences Store, Car Make And Model Database, Working With Language Bindings.

UNIT II

Interacting with NoSQL: If NoSql Then What, Language Bindings For NoSQL Data Stores, Performing Crud Operations, Creating Records, Accessing Data, Updating And Deleting Data.

UNIT III

NoSQL Storage Architecture: Working With Column-Oriented Databases, Hbase Distributed Storage Architecture, Document Store Internals, Understanding Key/Value Stores In Memcached And Redis, Eventually Consistent Non-Relational Databases.

UNIT IV

NoSQL Stores: Similarities Between Sql And MongoDB Query Features, Accessing Data From Column-Oriented Databases Like Hbase, Querying Redis Data Stores, Changing Document Databases, Schema Evolution In Column-Oriented Databases, Hbase Data Import And Export, Data Evolution In Key/Value Stores.

UNIT V

Indexing and Ordering Data Sets : Essential Concepts Behind A Database Index, Indexing And Ordering In MongoDB, Creating and Using Indexes In MongoDB, Indexing And Ordering In Couchdb, Indexing In Apache Cassandra.

Text Books:

- 1) Pramod Sadalage and Martin Fowler, NoSQL Distilled, Addison-Wesley Professional, 2012.
- 2) Dan McCreary and Ann Kelly, Making Sense of NoSQL, Manning Publications, 2013.



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Reference Books:

- 1) Shashank Tiwari, Professional NoSQL, Wrox Press, Wiley, 2011, ISBN: 978-0-470-94224-6
- 2) Gaurav Vaish, Getting Started with NoSQL, Packt Publishing, 2013.

e-Resources:

- 1) <https://www.trustradius.com/nosql-databases>



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IV Year –I Semester	L	T	P	C
	3	0	0	3
INTERNET OF THINGS				

Course Objectives:

- Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem
- Formalize a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc)
- Implement basic AI algorithms (e.g., standard search algorithms or dynamic programming)
- Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports

Course Outcomes:

- Describe the usage of the term 'the internet of things' in different contexts
- Discover the various network protocols used in IoT and familiar with the key wireless technologies used in IoT systems, such as Wi-Fi, 6LoWPAN, Bluetooth and ZigBee
- Define the role of big data, cloud computing and data analytics in a typical IoT system
Design a simple IoT system made up of sensors, wireless network connection, data analytics and display/actuators, and write the necessary control software
- Build and test a complete working IoT system

UNIT I

The Internet of Things: An Overview of Internet of Things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples of IoTs, Design Principles For Connected Devices.

UNIT II

Modified OSI Stack for the IoT/M2M Systems, ETSI M2M domains and High-level capabilities, Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability.

UNIT III

Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

UNIT IV

Data link layer of IoT, Wireless Communication Technologies, Wired Communication Technologies, Manet Networks: Network Layer of IoT, 6LoWPAN adaptation layer for devices with limited resources, Dynamic routing protocols for wireless adhoc networks Communication protocols for IoT, Service oriented protocol(COAP), Communication protocols based on the exchange of messages(MQTT), Service discovery protocols.

UNIT V

Data Acquiring, Organizing and Analytics in IoT/M2M, Applications/ Services/ Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.



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Text Books:

- 1) Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education.
- 2) Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015.

Reference Books:

- 1) An Introduction to Internet of Things, Connecting devices, Edge Gateway and Cloud with Applications, Rahul Dubey, Cengage, 2019.
- 2) IoT Fundamentals, Networking Technologies, Protocols and Use Cases for the Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetette, rob Barton, Jerome Henry, CISCO, Pearson, 2018.
- 3) Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley.



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IV Year –I Semester		L	T	P	C
		3	0	0	3
SOFTWARE PROJECT MANAGEMENT					

Course Objectives:

At the end of the course, the student shall be able to:

- To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
- To compare and differentiate organization structures and project structures
- To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

Course Outcomes:

Upon the completion of the course students will be able to:-

- Apply the process to be followed in the software development life-cycle models.
- Apply the concepts of project management & planning.
- Implement the project plans through managing people, communications and change
- Conduct activities necessary to successfully complete and close the Software projects
- Implement communication, modeling, and construction & deployment practices in software development.

UNIT I

Conventional Software Management: The waterfall model, conventional software Management performance.

Evolution of Software Economics: Software Economics, pragmatic software cost estimation.

Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

UNIT II

The Old Way and The New: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

Life Cycle Phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

Artifacts of The Process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT III

Model Based Software Architectures: A Management perspective and technical perspective.

Work Flows of the Process: Software process workflows, Iteration workflows.

Checkpoints of the Process: Major mile stones, Minor Milestones, Periodic status assessments.



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UNIT IV

Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

UNIT V

Process Automation: Automation Building blocks, The Project Environment.

Project Control and Process Instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

Project Estimation and Management: COCOMO model, Critical Path Analysis, PERT technique, Monte Carlo approach (Text book 2)

Text Books:

- 1) Software Project Management, Walker Royce, Pearson Education, 2005.
- 2) Software Project Management, Bob Hughes, 4th edition, Mike Cotterell, TMH.

Reference Books:

- 1) Software Project Management, Joel Henry, Pearson Education.
- 2) Software Project Management in practice, Pankaj Jalote, Pearson Education, 2005.
- 3) Effective Software Project Management, Robert K. Wysocki, Wiley, 2006.



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IV Year –I Semester		L	T	P	C
		3	0	0	3
WEB SERVICES					

Course Objective:

- To understand the concept of XML and to implement Web services using XML based standards

Course Outcomes:

After the completion of the course, student will be able to

- Recite the advantages of using XML technology family
- Analyze the problems associated with tightly coupled distributed software architecture
- Learn the Web services building block
- Implement e-business solutions using XML based web services

UNIT I

XML technology family : XML, benefits, Advantages of XML over HTML, EDI, Databases, XML based standards, Structuring with schemas, DTD, XML Schemas, XML processing, DOM, SAX, presentation technologies, XSL, XFORMS, XHTML, Transformation, XSLT, XLINK, XPATH, XQuery.

UNIT II

Architecting Web Services: Business motivations for web services, B2B, B2C, Technical motivations, limitations of CORBA and DCOM, Service-oriented Architecture (SOA), Architecting web services, Implementation view, web services technology stack, logical view, composition of web services, deployment view, from application server to peer to peer, process view, life in the runtime.

UNIT III

Web Services Building Blocks: Transport protocols for web services, messaging with web services, protocols, SOAP, describing web services, WSDL, Anatomy of WSDL, manipulating WSDL, web service policy, Discovering web services, UDDI, Anatomy of UDDI, Web service inspection, Ad-Hoc Discovery, Securing web services.

UNIT IV

Implementing XML in E-Business: B2B – B2C Applications, Different types of B2B interaction, Components of e-business XML systems, ebXML, RosettaNet, Applied XML in vertical industry, web services for mobile devices.

UNIT V

XML Content Management and Security: Semantic Web, Role of Meta data in web content, Resource Description Framework, RDF schema, Architecture of semantic web, content management workflow, XLANG, WSFL, Securing web services.

Text Books:

- 1) Ron Schmelzer et al. “ XML and Web Services”, Pearson Education, 2002.

Reference Books:

- 1) Keith Ballinger, “. NET Web Services Architecture and Implementation”, Pearson Education, 2003.
- 2) David Chappell, “Understanding .NET A Tutorial and Analysis”, Addison Wesley, 2002.
- 3) Kennard Scibner and Mark C.Stiver, “ Understanding SOAP”, SAMS publishing.



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- 4) Alexander Nakhimovsky and Tom Myers, “XML Programming: Web Applications and Web Services with JSP and ASP”, Apress, 2002.



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IV Year –I Semester	L	T	P	C
	3	0	0	3
CLOUD COMPUTING				

Course Objectives:

- To implement Virtualization
- To implement Task Scheduling algorithms
- Apply Map-Reduce concept to applications
- To build Private Cloud
- Broadly educate to know the impact of engineering on legal and societal issues involved

Course Outcomes:

At the end of the course, student will be able to

- Interpret the key dimensions of the challenge of Cloud Computing
- Examine the economics, financial, and technological implications for selecting cloud computing for own organization
- Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications
- Evaluate own organizations' needs for capacity building and training in cloud computing-related IT areas
- Illustrate Virtualization for Data-Center Automation

UNIT I

Introduction: Network centric computing, Network centric content, peer-to-peer systems, cloud computing delivery models and services, Ethical issues, Vulnerabilities, Major challenges for cloud computing. Parallel and Distributed Systems: introduction, architecture, distributed systems, communication protocols, logical clocks, message delivery rules, concurrency, and model concurrency with Petri Nets.

UNIT II

Cloud Infrastructure: At Amazon, The Google Perspective, Microsoft Windows Azure, Open Source Software Platforms, Cloud storage diversity, Inter cloud, energy use and ecological impact, responsibility sharing, user experience, Software licensing, Cloud Computing : Applications and Paradigms: Challenges for cloud, existing cloud applications and new opportunities, architectural styles, workflows, The Zookeeper, HPC on cloud.

UNIT III

Cloud Resource virtualization: Virtualization, layering and virtualization, virtual machine monitors, virtual machines, virtualization- full and para, performance and security isolation, hardware support for virtualization, Case Study: Xen, vBlades, Cloud Resource Management and Scheduling: Policies and Mechanisms, Applications of control theory to task scheduling, Stability of a two-level resource allocation architecture, feedback control based on dynamic thresholds, coordination, resource bundling, scheduling algorithms, fair queuing, start time fair queuing, cloud scheduling subject to deadlines, Scheduling Map Reduce applications, Resource management and dynamic application scaling.

UNIT IV

Storage Systems: Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system. Apache Hadoop, Big Table, Megastore (text book 1), Amazon Simple Storage Service(S3) (Text book 2), Cloud



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Security: Cloud security risks, security – a top concern for cloud users, privacy and privacy impact assessment, trust, OS security, Virtual machine security, Security risks.

UNIT V

Cloud Application Development: Amazon Web Services : EC2 – instances, connecting clients, security rules, launching, usage of S3 in Java, Cloud based simulation of a Distributed trust algorithm, Cloud service for adaptive data streaming (Text Book 1), Google: Google App Engine, Google Web Toolkit (Text Book 2), Microsoft: Azure Services Platform, Windows live, Exchange Online, Share Point Services, Microsoft Dynamics CRM (Text Book 2)

Text Books:

- 1) Cloud Computing, Theory and Practice, 1st Edition, Dan C Marinescu, MK Elsevier publisher, 2013
- 2) Cloud Computing, A Practical Approach, 1st Edition, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH, 2017

Reference Books:

- 1) Mastering Cloud Computing, Foundations and Application Programming, 1st Edition, Raj Kumar Buyya, Christen vecctiola, S Tammarai selvi, TMH, 2013
- 2) Essential of Cloud Computing, 1st Edition, K Chandrasekharan, CRC Press, 2014.
- 3) Cloud Computing, A Hands on Approach, Arshdeep Bahga, Vijay Madiseti, Universities Press, 2014.



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

IV Year –I Semester	L	T	P	C
	3	0	0	3
MEAN STACK TECHNOLOGIES				

Course Objectives:

From the course the student will learn

- Translate user requirements into the overall architecture and implementation of new systems and Manage Project and coordinate with the Client
- Writing optimized front end code HTML and JavaScript
- Monitor the performance of web applications & infrastructure and Troubleshooting web application with a fast and accurate a resolution
- Design and implementation of Robust and Scalable Front End Applications

After the completion of the course, student will be able to

- Enumerate the Basic Concepts of Web & Markup Languages
- Develop web Applications using Scripting Languages & Frameworks
- Make use of Express JS and Node JS frameworks
- Illustrate the uses of web services concepts like restful, react js
- Apply Deployment Techniques & Working with cloud platform

UNIT I

Introduction to Web: Internet and World Wide Web, Domain name service, Protocols: HTTP, FTP, SMTP. Html5 concepts, CSS3, Anatomy of a web page. XML: Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches.

UNIT II

JavaScript: The Basic of JavaScript: Objects, Primitives Operations and Expressions, Control Statements, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions. Angular Java Script Angular JS Expressions: ARRAY, Objects, \$eval, Strings, Angular JS Form Validation & Form Submission, Single Page Application development using Angular JS.

UNIT III

Node.js: Introduction, Advantages, Node.js Process Model, Node JS Modules. Express.js: Introduction to Express Framework, Introduction to Nodejs , What is Nodejs, Getting Started with Express, Your first Express App, Express Routing, Implementing MVC in Express, Middleware, Using Template Engines, Error Handling , API Handling , Debugging, Developing Template Engines, Using Process Managers, Security & Deployment.

UNIT IV

RESTful Web Services: Using the Uniform Interface, Designing URIs, Web Linking, Conditional Requests. React Js: Welcome to React, Obstacles and Roadblocks, React's Future, Keeping Up with the Changes, Working with the Files, Pure React, Page Setup, The Virtual DOM, React Elements, ReactDOM, Children, Constructing Elements with Data, React Components, DOM Rendering, Factories.

UNIT V

Mongo DB: Introduction, Architecture, Features, Examples, Database Creation & Collection in Mongo DB. Deploying Applications: Web hosting & Domains, Deployment Using Cloud Platforms.



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Text Books:

- 1) Programming the World Wide Web, Robert W Sebesta, 7ed, Pearson.
- 2) Web Technologies, Uttam K Roy, Oxford
- 3) Pro Mean Stack Development, ELadElrom, Apress
- 4) Restful Web Services Cookbook, Subbu Allamraju, O'Reilly
- 5) JavaScript & jQuery the missing manual, David sawyer mcfarland, O'Reilly
- 6) Web Hosting for Dummies, Peter Pollock, John Wiley Brand

Reference Books:

- 1) Ruby on Rails up and Running, Lightning fast Web development, Bruce Tate, Curt Hibbs, Oreilly (2006).
- 2) Programming Perl, 4ed, Tom Christiansen, Jonathan Orwant, Oreilly (2012).
- 3) Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
- 4) An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning.
- 5) Express.JS Guide, The Comprehensive Book on Express.js, Azat Mardan, Lean Publishing.

e-Resources:

- 1) <http://www.upriss.org.uk/perl/PerlCourse.html>



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IV Year –I Semester		L	T	P	C
		3	0	0	3
AD-HOC AND SENSOR NETWORKS					

Course Objectives:

From the course the student will learn

- Architect sensor networks for various application setups
- Devise appropriate data dissemination protocols and model links cost
- Understanding of the fundamental concepts of wireless sensor networks and has a basic knowledge of the various protocols at various layers
- Evaluate the performance of sensor networks and identify bottlenecks

Course Outcomes:

- Evaluate the principles and characteristics of mobile ad hoc networks (MANETs) and what distinguishes them from infrastructure-based networks
- Determine the principles and characteristics of wireless sensor networks
- Discuss the challenges in designing MAC, routing and transport protocols for wireless ad-hoc sensor networks
- Illustrate the various sensor network Platforms, tools and applications
- Demonstrate the issues and challenges in security provisioning and also familiar with the mechanisms for implementing security and trust mechanisms in MANETs and WSNs

UNIT I

Introduction to Ad Hoc Wireless Networks- Cellular and Ad Hoc Wireless Networks, Characteristics of MANETs, Applications of MANETs, Issues and Challenges of MANETs, Ad Hoc Wireless Internet, MAC protocols for Ad hoc Wireless Networks-Issues, Design Goals and Classifications of the MAC Protocols.

UNIT II

Routing Protocols for Ad Hoc Wireless Networks- Issues in Designing a Routing Protocol, Classifications of Routing Protocols, Topology-based versus Position-based Approaches, Issues and design goals of a Transport layer protocol, Classification of Transport layer solutions, TCP over Ad hoc Wireless Networks, Solutions for TCP over Ad Hoc Wireless Networks, Other Transport layer protocols.

UNIT III

Security protocols for Ad hoc Wireless Networks- Security in Ad hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad hoc Wireless Networks, Cooperation in MANETs, Intrusion Detection Systems.

UNIT IV

Basics of Wireless Sensors and Applications- The Mica Mote, Sensing and Communication Range, Design Issues, Energy Consumption, Clustering of Sensors, Applications, Data Retrieval in Sensor Networks-Classification of WSNs, MAC layer, Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

UNIT V

Security in WSNs- Security in WSNs, Key Management in WSNs, Secure Data Aggregation in WSNs, Sensor Network Hardware-Components of Sensor Mote, Sensor Network Operating Systems-TinyOS, LA-TinyOS, SOS, RETOS, Imperative Language-nesC, Dataflow Style



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Language- TinyGALS, Node-Level Simulators, NS-2 and its sensor network extension, TOSSIM.

Text Books:

- 1) Ad Hoc Wireless Networks – Architectures and Protocols, C. Siva Ram Murthy, B. S. Murthy, Pearson Education, 2004.
- 2) Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P. Aggarwal, World Scientific Publications / Cambridge University Press, March 2006.
- 3) Wireless Sensor Networks – Principles and Practice, Fei Hu, Xiaojun Cao, An Auerbach book, CRC Press, Taylor & Francis Group, 2010.

Reference Books:

- 1) Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science imprint, Morgan Kaufman Publishers, 2005, rp2009.
- 2) Wireless Ad hoc Mobile Wireless Networks – Principles, Protocols and Applications, Subir Kumar Sarkar, et al., Auerbach Publications, Taylor & Francis Group, 2008.
- 3) Ad hoc Networking, Charles E. Perkins, Pearson Education, 2001.
- 4) Wireless Ad hoc Networking, Shih-Lin Wu, Yu-Chee Tseng, Auerbach Publications, Taylor & Francis Group, 2007.



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IV Year –I Semester		L	T	P	C
		3	0	0	3
CYBER SECURITY & FORENSICS					

Course Objectives:

- Able to identify security risks and take preventive steps
- To understand the forensics fundamentals
- To understand the evidence capturing process
- To understand the preservation of digital evidence

Course Outcomes:

At the end of the course, student will be able to

- Enumerate the computer forensics fundamentals
- Describe the types of computer forensics technology
- Analyze various computer forensics systems
- Illustrate the methods for data recovery, evidence collection and data seizure
- Identify the Role of CERT-In Security

UNIT I

Introduction to Cybercrime: Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Cybercriminals, Classifications of Cybercrime, Cyberstalking, Cybercafe and Cybercrimes, Botnets. Attack Vector, Proliferation of Mobile and Wireless Devices, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Network and Computer Attacks.

UNIT II

Tools and Methods : Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, Sniffers, Spoofing, Session Hijacking Buffer over flow, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Identity Theft (ID Theft), Foot Printing and Social Engineering, Port Scanning, Enumeration.

UNIT III

Cyber Crime Investigation: Introduction, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.

UNIT IV

Computer Forensics and Investigations: Understanding Computer Forensics, Preparing for Computer Investigations. Current Computer Forensics Tools: Evaluating Computer Forensics Tools, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating and Testing Forensics Software, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Graphics and Network Forensics, E-mail Investigations, Cell Phone and Mobile Device Forensics.

UNIT V

Cyber Crime Legal Perspectives: Introduction, Cybercrime and the Legal Landscape around the World, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital



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Signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment, Cyberlaw, Technology and Students: Indian Scenario.

Text Books:

- 1) Sunit Belapure Nina Godbole “Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, WILEY, 2011.
- 2) Nelson Phillips and Einfinger Steuart, “Computer Forensics and Investigations”, Cengage Learning, New Delhi, 2009.

Reference Books:

- 1) Michael T. Simpson, Kent Backman and James E. Corley, “Hands on Ethical Hacking and Network Defence”, Cengage, 2019.
- 2) Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.
- 3) Alfred Basta, Nadine Basta, Mary Brown and Ravinder Kumar “Cyber Security and Cyber Laws” , Cengage, 2018.

e-Resources:

- 1) CERT-In Guidelines- <http://www.cert-in.org.in/>
- 2) <https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks> [Online Course]
- 3) <https://computersecurity.stanford.edu/free-online-videos> [Free Online Videos]
- 4) Nickolai Zeldovich. 6.858 Computer Systems Security. Fall 2014. Massachusetts Institute of Technology: MIT OpenCourseWare, <https://ocw.mit.edu>. License: [Creative Commons BY-NC-SA](https://creativecommons.org/licenses/by-nc-sa/4.0/).



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IV Year –I Semester	L	T	P	C
	0	0	2	1
UML LAB				

Course Objectives:

- To know the practical issues of the different object oriented analysis and design concepts
- Inculcate the art of object oriented software analysis and design
- Apply forward and reverse engineering of a software system
- Carry out the analysis and design of a system in an object oriented way

Course Outcomes:

At the end of the course, student will be able to

- Know the syntax of different UML diagrams
- Create use case documents that capture requirements for a software system
- Create class diagrams that model both the domain model and design model of a software system
- Create interaction diagrams that model the dynamic aspects of a software system
- Write code that builds a software system
- Develop simple applications

Note: For performing the experiments consider any case study (ATM/ Banking / Library /Hospital management systems)

Experiment 1:

Familiarization with Rational Rose or Umbrella environment

Experiment 2:

- Identify and analyze events
- Identify Use cases
- Develop event table

Experiment 3:

- Identify & analyze domain classes
- Represent use cases and a domain class diagram using Rational Rose
- Develop CRUD matrix to represent relationships between use cases and problem domain classes

Experiment 4:

- Develop Use case diagrams
- Develop elaborate Use case descriptions & scenarios
- Develop prototypes (without functionality)

Experiment 5:

- Develop system sequence diagrams and high-level sequence diagrams for each use case
- Identify MVC classes / objects for each use case
- Develop Detailed Sequence Diagrams / Communication diagrams for each use case showing interactions among all the three-layer objects

Experiment 6:

- Develop detailed design class model (use GRASP patterns for responsibility assignment)
- Develop three-layer package diagrams for each case study



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Experiment 7:

- a) Develop Use case Packages
- b) Develop component diagrams
- c) Identify relationships between use cases and represent them
- d) Refine domain class model by showing all the associations among classes

Experiment 8:

Develop sample diagrams for other UML diagrams - state chart diagrams, activity diagrams and deployment diagrams



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IV Year –I Semester		L	T	P	C
		0	0	0	2
PROJECT-I					

Note: The marks are awarded based on: Selection of Area, Defining the problem, Submission of the Abstract and Presentation of seminar.



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IV Year –I Semester	L	T	P	C
	3	0	0	0
IPR & PATENTS				

Course Objectives:

- To know the importance of Intellectual property rights, which plays a vital role in advanced Technical and Scientific disciplines
- Imparting IPR protections and regulations for further advancement, so that the students can familiarize with the latest developments

Course Outcomes:

- IPR Laws and patents pave the way for innovative ideas which are instrumental for inventions to seek Patents
- Student get an insight on Copyrights, Patents and Software patents which are instrumental for further advancements

UNIT I

Introduction to Intellectual Property Rights (IPR): Concept of Property - Introduction to IPR – International Instruments and IPR - WIPO - TRIPS – WTO -Laws Relating to IPR - IPR Tool Kit - Protection and Regulation - Copyrights and Neighboring Rights – Industrial Property – Patents - Agencies for IPR Registration – Traditional Knowledge –Emerging Areas of IPR - Layout Designs and Integrated Circuits – Use and Misuse of Intellectual Property Rights.

UNIT II

Copyrights and Neighboring Rights: Introduction to Copyrights – Principles of Copyright Protection – Law Relating to Copyrights - Subject Matters of Copyright – Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of Performers – Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Case Law - Semiconductor Chip Protection Act.

UNIT III

Patents: Introduction to Patents - Laws Relating to Patents in India – Patent Requirements – Product Patent and Process Patent - Patent Search - Patent Registration and Granting of Patent - Exclusive Rights – Limitations - Ownership and Transfer — Revocation of Patent – Patent Appellate Board - Infringement of Patent – Compulsory Licensing — Patent Cooperation Treaty – New developments in Patents – Software Protection and Computer related Innovations

UNIT IV

Trademarks: Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – Distinction between Trademark and Property Mark – Marks Covered under Trademark Law - Trade Mark Registration – Trade Mark Maintenance – Transfer of rights - Deceptive Similarities
 Likelihood of Confusion - Dilution of Ownership – Trademarks Claims and Infringement – Remedies – Passing Off Action.

UNIT V

Trade Secrets & Cyber Law and Cyber Crime: Introduction to Trade Secrets – General Principles - Laws Relating to Trade Secrets – Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreements – Breach of Contract –Law of



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Unfair Competition – Trade Secret Litigation – Applying State Law.

Cyber Law – Information Technology Act 2000 - Protection of Online and Computer Transactions –

E-commerce - Data Security – Authentication and Confidentiality - Privacy - Digital Signatures – Certifying Authorities - Cyber Crimes - Prevention and Punishment – Liability of Network Providers.

References Books:

- 1) Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, New Delhi.
- 2) Deborah E. Bouchoux: Intellectual Property, Cengage Learning, New Delhi.
- 3) PrabhuddhaGanguli: Intellectual Property Rights, Tata Mc-Graw –Hill, New Delhi
- 4) Richard Stim: Intellectual Property, Cengage Learning, New Delhi.
- 5) Kompal Bansal & Parishit Bansal Fundamentals of IPR for Engineers, B. S. Publications (Press).
- 6) Cyber Law - Texts & Cases, South-Western's Special Topics Collections.
- 7) R.Radha Krishnan, S.Balasubramanian: Intellectual Property Rights, Excel Books. New Delhi.
- 8) M.Ashok Kumar and MohdIqbal Ali: Intellectual Property Rights, Serials Pub.



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IV Year –II Semester	L	T	P	C
	3	0	0	3
MANAGEMENT AND ORGANIZATIONAL BEHAVIOR				

Course Objectives:

- To familiarize with the process of management, principles, leadership styles and basic concepts on Organization
- To provide conceptual knowledge on functional management that is on Human resource management and Marketing management
- To provide basic insight into select contemporary management practices and Strategic Management
- To learn theories of motivation and also deals with individual behavior, their personality and perception of individuals
- To understand about organizations groups that affect the climate of an entire organizations which helps employees in stress management

Course Outcomes:

- After completion of the Course the student will acquire the knowledge on management functions, global leadership and organizational structure
- Will familiarize with the concepts of functional management that is HRM and Marketing of new product developments
- The learner is able to think in strategically through contemporary management practices
- The learner can develop positive attitude through personality development and can equip with motivational theories
- The student can attain the group performance and grievance handling in managing the organizational culture

UNIT I

Introduction: Management and organizational concepts of management and organization- Nature and Importance of Management, Functions of Management, System approach to Management - Taylor's Scientific Management Theory, Fayol's Principles of Management, Leadership Styles, Social responsibilities of Management. Designing Organizational Structures: Basic concepts related to Organization - Departmentation and Decentralization, MBO, Process and concepts.

UNIT II

Functional Management: Human Resource Management (HRM) Concepts of HRM, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Wage and Salary Administration Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating. Marketing Management: Concepts of Marketing, Marketing mix elements and marketing strategies.

UNIT III

Strategic Management: Strategic Management and Contemporary Strategic Issues: Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and implementation, Generic Strategy alternatives. Bench Marking and Balanced Score Card as Contemporary Business Strategies.



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UNIT IV

Individual Behavior: Perception-Perceptual process- Impression management- Personality development – Socialization – Attitude- Process- Formation- Positive attitude- Change – Learning – Learning organizations- Reinforcement Motivation – Process- Motives – Theories of Motivation: Maslow’s Theory of Human Needs, Douglas McGregor’s Theory X and Theory Y, Herzberg’s Two-Factor Theory of Motivation.

UNIT V

Group Dynamics: Types of Groups, Stages of Group Development, Group Behaviour and Group Performance Factors, Organizational conflicts: Reasons for Conflicts, Consequences of Conflicts in Organization, Types of Conflicts, Strategies for Managing Conflicts, Organizational Climate and Culture, Stress, Causes and effects, coping strategies of stress.

Text Books:

- 1) Subba Rao P., Organizational Behaviour, Himalaya Publishing House. Mumbai
- 2) L.M. Prasad, Principles and Practice of Management.

Reference Books:

- 1) Fred Luthans Organizational Behaviour, TMH, New Delhi.
- 2) Robins, Stephen P., Fundamentals of Management, Pearson, India.
- 3) Kotler Philip & Keller Kevin Lane: Marketing Mangement 12/e, PHI, 2007
- 4) Koontz & Weihrich: Essentials of Management, 6/e, TMH, 2007
- 5) Kanishka Bedi, Production and Operations Management, Oxford University Press, 2007.



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		3	0	0	3
Open Elective –III					

Note: The student has to take any one **open elective course** offered in the other departments (or) SWAYAM/NPTEL courses offered by other than parent department. (12 week minimum).

Given below are some of the courses offered by NPTEL/SWAYAM

<p>Electronics & Communication Engineering</p> <ol style="list-style-type: none"> 1) Information Coding Theory 2) VLSI Design 3) Signals & Systems 4) Digital Signal Processing 	<p>Mathematics</p> <ol style="list-style-type: none"> 1) Optimization Techniques 2) Computational Number Theory and Cryptography
<p>Electrical and Electronics Engineering</p> <ol style="list-style-type: none"> 1) Networking Analysis 2) Fuzzy Sets, Logic and Systems & Applications 3) Energy Management Systems and SCADA 4) Industrial Safety Engineering 	<p>Civil Engineering</p> <ol style="list-style-type: none"> 1) Intelligent transportation engineering 2) Remote Sensing and GI 3) Engineering Mechanics 4) City and Metropolitan Planning 5) Sustainable Materials and Green Buildings
<p>Mechanical Engineering</p> <ol style="list-style-type: none"> 1) Industrial Automation and Control 2) Robotics 3) CAD 4) Mechatronics And Manufacturing Automation 5) Non Conventional Energy Resources 	



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		3	0	0	3
DEEP LEARNING					

Course Objectives:

- Demonstrate the major technology trends driving Deep Learning
- Build, train and apply fully connected deep neural networks
- Implement efficient (vectorized) neural networks
- Analyze the key parameters and hyper parameters in a neural network's architecture

Course Outcomes:

- Demonstrate the mathematical foundation of neural network
- Describe the machine learning basics
- Differentiate architecture of deep neural network
- Build a convolutional neural network
- Build and train RNN and LSTMs

UNIT I

Linear Algebra: Scalars, Vectors, Matrices and Tensors, Matrix operations, types of matrices, Norms, Eigen decomposition, Singular Value Decomposition, Principal Components Analysis. Probability and Information Theory: Random Variables, Probability Distributions, Marginal Probability, Conditional Probability, Expectation, Variance and Covariance, Bayes' Rule, Information Theory. Numerical Computation: Overflow and Underflow, Gradient-Based Optimization, Constrained Optimization, Linear Least Squares.

UNIT II

Machine Learning: Basics and Underfitting, Hyper parameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood, Bayesian Statistics, Supervised and Unsupervised Learning, Stochastic Gradient Descent, Challenges Motivating Deep Learning. Deep Feedforward Networks: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and other Differentiation Algorithms.

UNIT III

Regularization for Deep Learning: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop and Manifold Tangent Classifier. Optimization for Training Deep Models: Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms.

UNIT IV

Convolutional Networks: The Convolution Operation, Pooling, Convolution, Basic Convolution Functions, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, Basis for Convolutional Networks.



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UNIT V

Sequence Modeling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, Echo State Networks, LSTM, Gated RNNs, Optimization for Long-Term Dependencies, Auto encoders, Deep Generative Models.

Text Books:

- 1) Ian Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2016.
- 2) Josh Patterson and Adam Gibson, “Deep learning: A practitioner's approach”, O'Reilly Media, First Edition, 2017.

Reference Books:

- 1) Fundamentals of Deep Learning, Designing next-generation machine intelligence algorithms, Nikhil Buduma, O'Reilly, Shroff Publishers, 2019.
- 2) Deep learning Cook Book, Practical recipes to get started Quickly, Douwe Osinga, O'Reilly, Shroff Publishers, 2019.

e-Resources:

- 1) <https://keras.io/datasets/>
- 2) <http://deeplearning.net/tutorial/deeplearning.pdf>
- 3) <https://arxiv.org/pdf/1404.7828v4.pdf>



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		3	0	0	3
QUANTUM COMPUTING					

Course Objectives:

- This course teaches the fundamentals of quantum information processing, including quantum computation, quantum cryptography, and quantum information theory.

Course Outcomes:

By the end of this course, the student is able to

- Analyze the behaviour of basic quantum algorithms
- Implement simple quantum algorithms and information channels in the quantum circuit model
- Simulate a simple quantum error-correcting code
- Prove basic facts about quantum information channels

UNIT I

Introduction: Quantum Measurements Density Matrices, Positive-Operator Valued Measure, Fragility of quantum information: Decoherence, Quantum Superposition and Entanglement, Quantum Gates and Circuits.

UNIT II

Quantum Basics and Principles: No cloning theorem & Quantum Teleportation, Bell's inequality and its implications, Quantum Algorithms & Circuits.

UNIT III

Algorithms: Deutsch and Deutsch–Jozsa algorithms, Grover's Search Algorithm, Quantum Fourier Transform, Shore's Factorization Algorithm.

UNIT IV

Performance, Security and Scalability: Quantum Error Correction: Fault tolerance; Quantum Cryptography, Implementing Quantum Computing: issues of fidelity; Scalability in quantum computing.

UNIT V

Quantum Computing Models: NMR Quantum Computing, Spintronics and QED MODEL, Linear Optical MODEL, Nonlinear Optical Approaches; Limits of all the discussed approaches, Future of Quantum computing.

Text Books:

- 1) Eric R. Johnston, Nic Harrigan, Mercedes and Gimeno-Segovia "Programming Quantum Computers: Essential Algorithms And Code Samples, SHROFF/ O'Reilly.
- 2) Dr. Christine Corbett Moran, Mastering Quantum Computing with IBM QX: Explore the world of quantum computing using the Quantum Composer and Qiskit, Kindle Edition Packt
- 3) V.K Sahni, Quantum Computing (with CD), TATA McGrawHill.



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Reference Books:

- 1) Chris Bernhardt, Quantum Computing for Everyone (The MIT Press).
- 2) Michael A. Nielsen and Issac L. Chuang, “Quantum Computation and Information”, Cambridge (2002).
- 3) Riley Tipton Perry, “Quantum Computing from the Ground Up”, World Scientific Publishing Ltd (2012).
- 4) Scott Aaronson, “Quantum Computing since Democritus”, Cambridge (2013).
- 5) P. Kok, B. Lovett, “Introduction to Optical Quantum Information Processing”, Cambridge.

e-Resources:

- 1) <https://nptel.ac.in/courses/104104082/>
- 2) https://swayam.gov.in/nd1_noc19_cy31/preview



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IV Year –II Semester		L	T	P	C
		3	0	0	3
DevOps					

Course Objectives:

- DevOps improves collaboration and productivity by automating infrastructure and workflows and continuously measuring applications performance

Course Outcomes:

At the end of the course, student will be able to

- Enumerate the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT service agility
- Describe DevOps & DevSecOps methodologies and their key concepts
- Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models
- Set up complete private infrastructure using version control systems and CI/CD tools

UNIT I

Phases of Software Development life cycle. Values and principles of agile software development.

UNIT II

Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system.

UNIT III

DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

UNIT IV

CI/CD: Introduction to Continuous Integration, Continuous Delivery and Deployment , Benefits of CI/CD, Metrics to track CICD practices

UNIT V

Devops Maturity Model: Key factors of DevOps maturity model, stages of Devops maturity model, DevOps maturity Assessment

Text Books:

- 1) The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim , John Willis , Patrick Debois , Jez Humb, 1st Edition, O'Reilly publications, 2016.
- 2) What is Devops? Infrastructure as code, 1st Edition, Mike Loukides ,O'Reilly publications, 2012.

Reference Books:

- 1) Building a DevOps Culture, 1st Edition, Mandi Walls, O'Reilly publications, 2013.
- 2) The DevOps 2.0 Toolkit: Automating the Continuous Deployment Pipeline With Containerized Microservices, 1st Edition, Viktor Farcic, CreateSpace Independent Publishing Platform publications, 2016
- 3) Continuous Delivery: Reliable Software Releases Through Build, Test, and Deployment Automation, 1st Edition, Jez Humble and David Farley, 2010.
- 4) Achieving DevOps: A Novel About Delivering the Best of Agile, DevOps, and



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microservices, 1st Edition, Dave Harrison, Knox Lively, Apress publications, 2019

e-Resources:

- 1) <https://www.javatpoint.com/devops>
- 2) <https://github.com/nkatre/Free-DevOps-Books-1/blob>



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		3	0	0	3
BLOCKCHAIN TECHNOLOGIES					

Course Objectives:

By the end of the course, students will be able to

- Understand how block chain systems (mainly Bit coin and Ethereum) work and to securely interact with them,
- Design, build, and deploy smart contracts and distributed applications,
- Integrate ideas from block chain technology into their own projects.

Course Outcomes:

At the end of the course, student will be able to

- Demonstrate the foundation of the Block chain technology and understand the processes in payment and funding.
- Identify the risks involved in building Block chain applications.
- Review of legal implications using smart contracts.
- Choose the present landscape of Blockchain implementations and Understand Crypto currency markets
- Examine how to profit from trading crypto currencies.

UNIT I

Introduction, Scenarios, Challenges Articulated, Blockchain, Blockchain Characteristics, Opportunities Using Blockchain, History of Blockchain.

Evolution of Blockchain : Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Blockchain Evolution, Consortia, Forks, Public Blockchain Environments, Type of Players in Blockchain Ecosystem, Players in Market.

UNIT II

Blockchain Concepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on blockchain, data storage on blockchain, wallets, coding on blockchain: smart contracts, peer-to-peer network, types of blockchain nodes, risk associated with blockchain solutions, life cycle of blockchain transaction.

UNIT III

Architecting Blockchain solutions: Introduction, Obstacles for Use of Blockchain, Blockchain Relevance Evaluation Framework, Blockchain Solutions Reference Architecture, Types of Blockchain Applications.

Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Blockchain Solutions, Architecture Considerations, Architecture with Blockchain Platforms, Approach for Designing Blockchain Applications.

UNIT IV

Ethereum Blockchain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, MyEtherWallet, Ethereum Networks/Environments, Infura, Etherscan, Ethereum Clients, Decentralized Application, Metamask, Tuna Fish Use Case Implementation, OpenZeppelin Contracts

UNIT V

Hyperledger Blockchain Implementation, Introduction, Use Case – Car Ownership Tracking, Hyperledger Fabric, Hyperledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chaincode Functions Using Client Application.



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Advanced Concepts in Blockchain: Introduction, InterPlanetary File System (IPFS), Zero-Knowledge Proofs, Oracles, Self-Sovereign Identity, Blockchain with IoT and AI/ML Quantum Computing and Blockchain, Initial Coin Offering, Blockchain Cloud Offerings, Blockchain and its Future Potential.

Text Books:

- 1) Ambadas, Arshad Sarfarz Ariff, Sham “Blockchain for Enterprise Application Developers”, Wiley
- 2) Andreas M. Antonopoulos, “Mastering Bitcoin: Programming the Open Blockchain” , O’Reilly

Reference Books:

- 1) Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Bambara, Paul R. Allen, Mc Graw Hill.
- 2) Blockchain: Blueprint for a New Economy, Melanie Swan, O’Reilly

e-Resources:

- 1) <https://github.com/blockchainedindia/resources>



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IV Year –II Semester	L	T	P	C
	3	0	0	3
BIG DATA ANALYTICS				

Course Objectives:

- To optimize business decisions and create competitive advantage with Big Data analytics
- To learn to analyze the big data using intelligent techniques
- To introduce programming tools PIG & HIVE in Hadoop ecosystem

Course Outcomes:

At the end of the course, the students will be able to

- Illustrate big data challenges in different domains including social media, transportation, finance and medicine
- Use various techniques for mining data stream
- Design and develop Hadoop
- Identify the characteristics of datasets and compare the trivial data and big data for various applications
- Explore the various search methods and visualization techniques

UNIT I

Introduction: Introduction to big data: Introduction to Big Data Platform, Challenges of Conventional Systems, Intelligent data analysis, Nature of Data, Analytic Processes and Tools, Analysis vs Reporting.

UNIT II

Stream Processing: Mining data streams: Introduction to Streams Concepts, Stream Data Model and Architecture, Stream Computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Oneness in a Window, Decaying Window, Real time Analytics Platform (RTAP) Applications, Case Studies - Real Time Sentiment Analysis - Stock Market Predictions.

UNIT III

Introduction to Hadoop: Hadoop: History of Hadoop, the Hadoop Distributed File System, Components of Hadoop Analysing the Data with Hadoop, Scaling Out, Hadoop Streaming, Design of HDFS, Java interfaces to HDFS Basics, Developing a Map Reduce Application, How Map Reduce Works, Anatomy of a Map Reduce Job run, Failures, Job Scheduling, Shuffle and Sort, Task execution, Map Reduce Types and Formats, Map Reduce Features Hadoop environment.

UNIT IV

Frameworks and Applications: Frameworks: Applications on Big Data Using Pig and Hive, Data processing operators in Pig, Hive services, HiveQL, Querying Data in Hive, fundamentals of HBase and ZooKeeper.

UNIT V

Predictive Analytics and Visualizations: Predictive Analytics, Simple linear regression, Multiple linear regression, Interpretation of regression coefficients, Visualizations, Visual data analysis techniques, interaction techniques, Systems and application



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Text Books:

- 1) Tom White, “Hadoop: The Definitive Guide”, Third Edition, O’reilly Media, Fourth Edition, 2015.
- 2) Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data”, McGrawHill Publishing, 2012.
- 3) Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, CUP, 2012

Reference Books:

- 1) Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.
- 2) Paul Zikopoulos, Dirk deRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, “Harness the Power of Big Data: The IBM Big Data Platform”, Tata McGraw Hill Publications, 2012.
- 3) Arshdeep Bahga and Vijay Madisetti, “Big Data Science & Analytics: A Hands On Approach”, VPT, 2016.
- 4) Bart Baesens, “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)”, John Wiley & Sons, 2014.



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Open Electives to be offered by CSE for Other Branches:

Open Elective I:

For syllabus Refer to

Data Structures	CS2103
Java Programming	CS2201
Database Management Systems	CS2203
C++ Programming	CS2104
Operating Systems	CS2202
Internet of Things	PE4101

Open Elective II:

Problem Solving using Python	ES1201
Web Technologies	CS3201
Machine Learning	CS4103
Distributed Computing	CS3202
AI Tools & Techniques	CS3104
Data Science	PE4101

Open Elective III:

Big Data	PE4201
Image Processing	
Mobile Application Development	
Cyber Security	
Deep Learning	PE4201
Blockchain Technologies	PE4201



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Open Elective III (Offered by CSE to other departments)
IMAGE PROCESSING

Course Objectives:

- To become familiar with digital image fundamentals
- To get exposed to simple image enhancement techniques in Spatial and Frequency domain
- To learn concepts of degradation function and restoration techniques
- To study the image segmentation and representation techniques
- To become familiar with image compression and recognition methods

Course Outcomes:

At the end of the course, the students will be able to:

- Know and understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms
- Operate on images using the techniques of smoothing, sharpening and enhancement.
- Use the restoration concepts and filtering techniques
- Illustrate the basics of segmentation

UNIT I

Digital Image Fundamentals: Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - Color image fundamentals - RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT.

UNIT II

Image Enhancement: Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.

UNIT III

Image Restoration: Image Restoration - degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering.

UNIT IV

Image Segmentation: Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

UNIT V

Image Compression and Recognition: Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

Text Books:

- 1) Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Pearson, Third Edition, 2010.



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- 2) Anil K. Jain, Fundamentals of Digital Image Processing, Pearson, 2002.

Reference Books:

- 1) Kenneth R. Castleman, Digital Image Processing, Pearson, 2006.
- 2) D.E. Dudgeon and RM. Mersereau, Multidimensional Digital Signal Processing, Prentice Hall Professional Technical Reference, 1990.
- 3) William K. Pratt, Digital Image Processing, John Wiley, New York, 2002.



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Open Elective III (Offered by CSE to other departments)
MOBILE APPLICATION DEVELOPMENT

Course Objectives:

- To demonstrate the introduction and characteristics of mobile applications
- Application models of mobile application frameworks. Managing application data and User-interface design for mobile applications
- Integrating networking, the OS and hardware into mobile-applications
- Addressing enterprise requirements in mobile applications – performance, scalability, modifiability, availability and security
- Testing methodologies for mobile applications– Publishing, deployment, maintenance and management. To demonstrate their skills of using Android software development tools
- To demonstrate their ability to deploy software to mobile devices

Course Outcomes:

Upon completion of the course students should be able to:

- Install and configure Android application development tools.
- Design and develop user Interfaces for the Android platform.
- Use state information across important operating system events.
- Apply Java programming concepts to Android application development.

UNIT I

Introduction to mobile devices: Introduction to Mobile Computing, Introduction to Android Development Environment, Mobile devices vs. desktop devices, ARM and Intel architectures, Screen resolution, Touch interfaces, Application deployment, App Store, Google Play, Windows Store.

Development environments: XCode, Eclipse, VS2012, PhoneGAP, etc.; Native vs. web applications.

Factors in Developing Mobile Applications: Mobile Software Engineering, Frameworks and Tools, Generic UI Development, Android User.

UNIT II

Android User Interface: Measurements – Device and pixel density independent measuring units
User Interface (UI) Components – Editable and non editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers
Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities.

UNIT III

Back Ground Running Process, Networking And Telephony Services: Services: Introduction to services – local service, remote service and binding the service, the communication between service and activity, Intent Service.

MultiThreading: Handlers, AsyncTask.

Android network programming: Http Url Connection, Connecting to REST-based and SOAP based Web services.

Broad cast receivers: Local Broadcast Manager, Dynamic broadcast receiver, System Broadcast. Pending Intent, Notifications.



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UNIT IV

Android: Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications.

UNIT V

Advanced Topics: Power Management: Wake locks and assertions, Low-level OS support, Writing power-smart applications.

Augmented Reality via GPS and other sensors: GPS, Accelerometer, Camera.

Mobile device security in depth: Mobile malware, Device protections, iOS “Jailbreaking”, Android “rooting” and Windows’ “defenestration”; Security and Hacking: Active Transactions, More on Security, Hacking Android.

Text Books:

- 1) Bill Phillips, Chris Stewart, Brian Hardy, and Kristin Marsicano, Android Programming: The Big Nerd
- 2) Ranch Guide, Big Nerd Ranch LLC, 2nd edition, 2015.
- 3) Valentino Lee, Heather Schneider, and Robbie Schell, Mobile Applications: Architecture, Design and Development, Prentice Hall, 2004.
- 4) Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox) , 2012
- 5) Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013
- 6) Dawn Griffiths, David Griffiths, “*Head First: Android Development*” ,OReilly2015,ISBN: 9781449362188
- 7) <http://developer.android.com/develop/index.html>
- 8) Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012

Reference Books:

- 1) Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013
- 2) Tomasz Nurkiewicz and Ben Christensen, Reactive Programming with RxJava, O’Reilly Media, 2016.
- 3) Brian Fling, Mobile Design and Development, O’Reilly Media, Inc., 2009.
- 4) Maximiliano Firtman, Programming the Mobile Web, O’Reilly Media, Inc., 2nd ed., 2013.
- 5) Cristian Crumlish and Erin Malone, Designing Social Interfaces, 2nd ed., O’Reilly Media, Inc., 2014.
- 6) Suzanne Ginsburg, Designing the iPhone User Experience: A User-Centered Approach to Sketching and Prototyping iPhone Apps, Addison-Wesley Professional, 2010.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Open Elective III (Offered by CSE to other departments)
CYBER SECURITY

Course Objectives:

- In this course, the student will learn about the essential building blocks and basic concepts around cyber security such as Confidentiality, Integrity, Availability, Authentication, Authorization, Vulnerability, Threat & Risk and so on.

Course Outcomes:

At the end of the course, the students will be able to:

- Illustrate the broad set of technical, social & political aspects of Cyber Security and security management methods to maintain security protection
- Appreciate the vulnerabilities and threats posed by criminals, terrorist and nation states to national infrastructure
- Illustrate the nature of secure software development and operating systems
- Demonstrate the role security management plays in cyber security defense and legal and social issues at play in developing solutions.

UNIT I

Introduction: Introduction to Computer Security, Threats, Harm, Vulnerabilities, Controls, Authentication, Access Control, and Cryptography, Authentication, Access Control, Cryptography.

Programs and Programming: Unintentional (Non-malicious) Programming Oversights, Malicious Code—Malware, Countermeasures.

UNIT II

Web Security: User Side, Browser Attacks, Web Attacks Targeting Users, Obtaining User or Website Data, Email Attacks.

Operating Systems Security: Security in Operating Systems, Security in the Design of Operating Systems, Rootkit.

UNIT III

Network Security: Network Concepts, Threats to Network Communications, Wireless Network Security, Denial of Service, Distributed Denial-of-Service Strategic Defenses: Security Countermeasures, Cryptography in Network Security, Firewalls, Intrusion Detection and Prevention Systems, Network Management .

Cloud Computing and Security: Cloud Computing Concepts, Moving to the Cloud, Cloud Security Tools and Techniques, Cloud Identity Management, Securing IaaS.

UNIT IV

Privacy: Privacy Concepts, Privacy Principles and Policies, Authentication and Privacy, Data Mining, Privacy on the Web, Email Security, Privacy Impacts of Emerging Technologies, Where the Field Is Headed.

Management and Incidents: Security Planning, Business Continuity Planning, Handling Incidents, Risk Analysis, Dealing with Disaster.

UNIT V

Legal Issues and Ethics: Protecting Programs and Data, Information and the Law, Rights of Employees and Employers, Redress for Software Failures, Computer Crime, Ethical Issues in Computer Security, Incident Analysis with Ethics Emerging Topics: The Internet of Things, Economics, Computerized Elections, Cyber Warfare.



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Text Books:

- 1) Pfleeger, C.P., Security in Computing, Prentice Hall, 2010, 5th edition.
- 2) Schneier, Bruce. Applied Cryptography, Second Edition, John Wiley & Sons, 1996

Reference Books:

- 1) Rhodes-Ousley, Mark. Information Security: The Complete Reference, Second Edition, Information Security Management: Concepts and Practice, McGraw-Hill, 2013.
- 2) Whitman, Michael E. and Herbert J. Mattord. Roadmap to Information Security for IT and Infosec Managers. Boston, MA: Course Technology, 2011.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF INFORMATION TECHNOLOGY
COURSE STRUCTURE AND SYLLABUS

For

B. Tech INFORMATION TECHNOLOGY

(Applicable for batches admitted from 2019-2020)



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DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE STRUCTURE - R19

I Year – I SEMESTER

S. No	Course Code	Subjects	L	T	P	Credits
1	HS1101	English	3	0	0	3
2	BS1101	Mathematics - I	3	0	0	3
3	BS1106	Applied Chemistry	3	0	0	3
4	ES1112	Fundamentals of Computer Science	3	0	0	3
5	ES1103	Engineering Drawing	1	0	3	2.5
6	HS1102	English Lab	0	0	3	1.5
7	BS1107	Applied Chemistry Lab	0	0	3	1.5
8	ES1105	IT Workshop	0	0	3	1.5
9	MC1101	Environmental Science	3	0	0	0
Total Credits			16	0	12	19

I Year – II SEMESTER

S. No	Course Code	Subjects	L	T	P	Credits
1	BS1202	Mathematics – II	3	0	0	3
2	BS1203	Mathematics – III	3	0	0	3
3	BS1204	Applied Physics	3	0	0	3
4	ES1201	Programming for Problem Solving using C	3	0	0	3
5	ES1213	Digital Logic Design	3	0	0	3
6	BS1205	Applied Physics Lab	0	0	3	1.5
7	HS1203	Communication Skills Lab	0	1	2	2
8	ES1202	Programming for Problem Solving using C Lab	0	0	3	1.5
9	PR1201	Engineering Exploration Project	0	0	2	1
10	MC1204	Constitution of India	3	0	0	0
Total Credits			18	1	10	21



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II Year – I SEMESTER

S.No	Course Code	Courses	L	T	P	Credits
1	IT2101	Discrete Mathematical Structures	3	0	0	3
2	IT2102	Principles of Software Engineering	3	0	0	3
3	ES2101	Python Programming	3	0	0	3
4	IT2103	Data Structures	3	0	0	3
5	IT2104	Computer Organization	3	0	0	3
6	IT2105	Object Oriented Programming through C++	3	0	0	3
7	ES2102	Python Programming Lab	0	0	3	1.5
8	IT2106	Data Structures through C++ Lab	0	0	3	1.5
9	MC2101	Essence of Indian Traditional Knowledge	3	0	0	0
10	MC2102	Employability Skills - I*	2	0	0	0
Total			23	0	6	21
*Internal Evaluation through Seminar / Test conducted for 50 marks						

II Year – II SEMESTER

S.No	Course Code	Courses	L	T	P	Credits
1	BS2201	Probability and Statistics	3	0	0	3
2	IT2201	Java Programming	2	1	0	3
3	IT2202	Operating Systems	3	0	0	3
4	IT2203	Database Management Systems	3	0	0	3
5	IT2204	Theory of Computation	3	0	0	3
6	IT2205	Java Programming Lab	0	0	3	1.5
7	IT2206	UNIX Operating Systems Lab	0	0	2	1
8	IT2207	Database Management Systems Lab	0	0	3	1.5
9	MC2201	Professional Ethics & Human Values	3	0	0	0
10	PR2201	Socially Relevant Project*	0	0	2	1
Total			17	1	10	20
*Internal Evaluation through Seminar conducted for 50 marks						



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III Year – I SEMESTER

S.No	Course Code	Courses	L	T	P	Credits
1	IT3101	Advanced Data Structures	3	1	0	4
2	IT3102	Computer Networks	3	0	0	3
3	IT3103	Compiler Design	3	0	0	3
4	IT3104	Artificial Intelligence	3	0	0	3
5	PE3101	Professional Elective -I 1. Software Testing Methodologies 2. NoSQL Databases 3. Scripting Languages 4. Computer Graphics 5. R-Programming	3	0	0	3
6	IT3105	Design and Analysis of Algorithms	3	0	0	3
7	IT3106	Computer Networks & Compiler Design Lab	0	0	3	1.5
8	IT3107	AI Tools & Techniques Lab	0	0	3	1.5
9	MC3101	Employability Skills - II*	2	0	0	0
Total			20	1	6	22

***Internal Evaluation through Seminar / Test conducted for 50 marks**

III Year – II SEMESTER

S.No	Course Code	Courses	L	T	P	Credits
1	IT3201	Data Warehousing and Data Mining	3	0	0	3
2	OE3201	Open Elective- I (Inter Disciplinary)	3	0	0	3
3	IT3202	Web Technologies	3	0	0	3
4	PE3201	Professional Elective II (NPTEL/SWAYAM) Duration: 12 Weeks Minimum *Course/subject title can't be repeated	3	0	0	3
5	HS3201	Managerial Economics and Financial Accountancy	3	0	0	3
6	IT3203	Web Technologies Lab	0	0	3	1.5
7	IT3204	Data Mining Lab	0	0	3	1.5
8	PR3201	Industrial Training / Skill Development Programmes / Research Project in higher learning institutes	0	0	0	1
Total			15	0	6	19



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IV Year – I SEMESTER

S.No	Course Code	Courses	L	T	P	Credits
1	IT4101	Cryptography and Network Security	3	0	0	3
2	IT4102	Machine Learning	3	1	0	4
3	IT4103	Advanced Computer Networks	3	0	0	3
4	OE4101	Open Elective II (Inter Disciplinary)	3	0	0	3
5	PE4101	Professional Elective III 1. Big Data Analytics 2. Social Networking 3. Ad-hoc and Sensor Networks 4. Cloud Computing 5. Design Patterns	3	0	0	3
6	PE4102	Professional Elective IV 1. Distributed Systems 2. DevOps 3. Internet of Things 4. Data Science 5. Biometrics	3	0	0	3
7	IT4104	Unified Modeling Language (UML) Lab *	0	0	2	1
8	PR4101	Project –I	0	0	0	2
9	MC4101	IPR & Patents	3	0	0	0
Total			21	1	2	22
*Relevant theory to be taught in the lab						



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IV Year – II SEMESTER

S.No	Course Code	Courses	L	T	P	Credits
1	HS4201	Management and Organizational Behavior	3	0	0	3
2	OE4201	Open Elective- III (Inter Disciplinary)	3	0	0	3
3	PE4201	Professional Elective- V 1. Deep Learning 2. Quantum Computing 3. Blockchain Technologies 4. Software Project Management 5. Network Programming	3	0	0	3
4	PR4201	Project- II	0	0	0	7
Total			9	0	0	16

Open Electives to be offered by IT for Other Branches:

<p>Open Elective I:</p> <ol style="list-style-type: none"> 1. Data Structures 2. Java Programming 3. Data Base Management Systems 4. C++ Programming 5. Operating Systems 6. Internet of Things 	<p>Open Elective II:</p> <ol style="list-style-type: none"> 1. Problem Solving using Python 2. Web Technologies 3. Machine Learning 4. Distributed Computing 5. AI Tools & Techniques 6. Data Science
<p>Open Elective III:</p> <ol style="list-style-type: none"> 1. Big Data 2. Image Processing 3. Mobile Application Development 4. Cyber Security 5. Deep Learning 6. Block Chain Technologies 	



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I Year - I Semester		L	T	P	C
		3	0	0	3
ENGLISH (HS1101)					

Introduction

The course is designed to train students in receptive (listening and reading) as well as productive and interactive (speaking and writing) skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from *learning about the language* to *using the language*. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as IELTS, TOEFL, or BEC, besides being able to express themselves clearly in speech and competently handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratory sessions.

Course Objectives

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Course Outcomes

At the end of the module, the learners will be able to

- understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
- ask and answer general questions on familiar topics and introduce oneself/others
- employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
- recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
- form sentences using proper grammatical structures and correct word forms

UNIT I

Lesson-1: A Drawer full of happiness from "Infotech English", Maruthi Publications

Lesson-2: Deliverance by Premchand from "The Individual Society", Pearson Publications. (Non-detailed)



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Listening: Listening to short audio texts and identifying the topic. Listening to short audio texts and identifying the context and specific pieces of information to answer a series of questions both in speaking and writing.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests. Self introductions and introducing others.

Reading: Skimming text to get the main idea. Scanning to look for specific pieces of information.

Reading for Writing: Paragraph writing (specific topics) using suitable cohesive devices; linkers, sign posts and transition signals; mechanics of writing - punctuation, capital letters.

Vocabulary: Technical vocabulary from across technical branches (20) GRE Vocabulary (20) (Antonyms and Synonyms, Word applications) Verbal reasoning and sequencing of words.

Grammar: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countables and uncountables; singular and plural basic sentence structures; simple question form - wh-questions; word order in sentences.

Pronunciation: Vowels, Consonants, Plural markers and their realizations

UNIT II

Lesson-1: Nehru's letter to his daughter Indira on her birthday from "Infotech English", Maruthi Publications

Lesson-2: Bosom Friend by Hira Bansode from "The Individual Society", Pearson Publications. (Non-detailed)

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts, both in speaking and writing.

Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks.

Functional English: Greetings and leave takings.

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words) (Antonyms and Synonyms, Word applications)

Grammar: Use of articles and zero article; prepositions.

Pronunciation: Past tense markers, word stress-di-syllabic words

UNIT III

Lesson-1: Stephen Hawking-Positivity 'Benchmark' from "Infotech English", Maruthi Publications

Lesson-2: Shakespeare's Sister by Virginia Woolf from "The Individual Society", Pearson Publications. (Non-detailed)

Listening: Listening for global comprehension and summarizing what is listened to, both in speaking and writing.



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Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed. Functional English: Complaining and Apologizing.

Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension. Critical reading.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Letter writing-types, format and principles of letter writing. E-mail etiquette, Writing CV's.

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Association, sequencing of words

Grammar: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Pronunciation: word stress-poly-syllabic words

UNIT IV

Lesson-1: Liking a Tree, Unbowed: Wangari Maathai-biography from “Infotech English”, Maruthi Publications

Lesson-2: Telephone Conversation-Wole Soyinka from “The Individual Society”, Pearson Publications. (Non-detailed)

Listening: Making predictions while listening to conversations/ transactional dialogues without video (only audio); listening to audio-visual texts.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. Functional English: Permissions, Requesting, Inviting.

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicative process or display complicated data.

Reading for Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. Writing SOP, writing for media.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Cloze Encounters.

Grammar: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms

Pronunciation: Contrastive Stress

UNIT V

Lesson-1: Stay Hungry-Stay foolish from “Infotech English”, Maruthi Publications

Lesson-2: Still I Rise by Maya Angelou from “The Individual Society”, Pearson Publications. (Non-detailed)

Listening: Identifying key terms, understanding concepts and interpreting the concepts both in speaking and writing.

Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides.

Functional English: Suggesting/Opinion giving.



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Reading: Reading for comprehension. RAP Strategy Intensive reading and Extensive reading techniques.

Reading for Writing: Writing academic proposals- writing research articles: format and style.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Coherence, matching emotions.

Grammar: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Pronunciation: Stress in compound words

Text Books:

- 1) “Infotech English”, Maruthi Publications. (Detailed)
- 2) “The Individual Society”, Pearson Publications. (Non-detailed)

Reference Books:

- 1) Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
- 2) Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
- 3) Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
- 4) Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.



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DEPARTMENT OF INFORMATION TECHNOLOGY

I Year - I Semester		L	T	P	C
		3	0	0	3
MATHEMATICS-I (BS1101) (Common to all Branch's for I Year B. Tech)					

Course Objectives:

- This course will illuminate the students in the concepts of calculus.
- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Course Outcomes:

At the end of the course, the student will be able to

- Utilize mean value theorems to real life problems (L3)
- Solve the differential equations related to various engineering fields (L3)
- Familiarize with functions of several variables which is useful in optimization (L3)
- Apply double integration techniques in evaluating areas bounded by region (L3)
- Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems (L5)

UNIT I: Sequences, Series and Mean value theorems: (10 hrs)

Sequences and Series: Convergences and divergence – Ratio test – Comparison tests – Integral test – Cauchy's root test – Alternate series – Leibnitz's rule.

Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders.

UNIT II: Differential equations of first order and first degree: (10 hrs)

Linear differential equations – Bernoulli's equations – Exact equations and equations reducible to exact form.

Applications: Newton's Law of cooling – Law of natural growth and decay – Orthogonal trajectories – Electrical circuits.

UNIT III: Linear differential equations of higher order: (10 hrs)

Non-homogeneous equations of higher order with constant coefficients – with non-homogeneous term of the type e^{ax} , $\sin ax$, $\cos ax$, polynomials in x^n , $e^{ax} V(x)$ and $x^n V(x)$ – Method of Variation of parameters.

Applications: LCR circuit, Simple Harmonic motion.

UNIT IV: Partial differentiation: (10 hrs)

Introduction – Homogeneous function – Euler's theorem – Total derivative – Chain rule – Jacobian – Functional dependence – Taylor's and Mc Laurent's series expansion of functions of two variables.

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).



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UNIT V: Multiple integrals:

(8 hrs)

Double and Triple integrals – Change of order of integration – Change of variables.

Applications: Finding Areas and Volumes.

Text Books:

- 1) B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
- 2) B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

- 1) Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India.
- 2) Joel Hass, Christopher Heil and Maurice D. Weir, Thomas calculus, 14th Edition, Pearson.
- 3) Lawrence Tury, Advanced Engineering Mathematics, CRC Press, 2013.
- 4) Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.

I Year - I Semester		L	T	P	C
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		3	0	0	3
APPLIED CHEMISTRY (BS1106)					

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

Course Objectives:

- *Importance* of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- *Outline* the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
- *Express* the increase in demand as wide variety of advanced materials are introduced; which have excellent engineering properties.
- *Explain* the crystal structures, and the preparation of semiconductors. Magnetic properties are also studied.
- *Recall* the increase in demand for power and hence alternative sources of power are studied due to depleting sources of fossil fuels. Advanced instrumental techniques are introduced.

UNIT I: Polymer Technology

Polymerisation:- Introduction-methods of polymerization (emulsion and suspension)-physical and mechanical properties.

Plastics: Compounding-fabrication (compression, injection, blown film, extrusion) - preparation, properties and applications of PVC, polycarbonates and Bakelite-mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste.

Elastomers:- Natural rubber-drawbacks-vulcanization-preparation, properties and applications of synthetic rubbers (Buna S, thiokol and polyurethanes).

Composite materials: Fiber reinforced plastics-conducting polymers-biodegradable polymers-biopolymers-biomedical polymers.

Learning Outcomes: *At the end of this unit, the students will be able to*

- *Outline* the properties of polymers and various additives added and different methods of forming plastic materials.
- *Explain* the preparation, properties and applications of some plastic materials.
- *Interpret* the mechanism of conduction in conducting polymers .
- *Discuss* natural and synthetic rubbers and their applications.

UNIT II: Electrochemical Cells and Corrosion

Single electrode potential-Electrochemical series and uses of series-standard hydrogen electrode, calomel electrode-concentration cell-construction of glass electrode-Batteries: Dry cell, Ni-Cd cells, Ni-Metal hydride cells, Li ion battery, zinc air cells–Fuel cells: H₂-O₂, CH₃OH-O₂, phosphoric acid, molten carbonate.

*Corrosion:-*Definition-theories of corrosion (chemical and electrochemical)-galvanic corrosion, differential aeration corrosion, stress corrosion, waterline corrosion-passivity of metals-galvanic series-factors influencing rate of corrosion-corrosion control (proper designing, cathodic protection)-Protective coatings: Surface preparation, cathodic and anodic coatings, electroplating, electroless plating (nickel).



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Paints (constituents, functions, special paints).

Learning Outcomes: *At the end of this unit, the students will be able to*

- *Explain* the theory of construction of battery and fuel cells.
- *Categorize* the reasons for corrosion and study some methods of corrosion control.

UNIT III: Material Chemistry

Part I:

Non-elemental semiconducting materials:- Stoichiometric, controlled valency & chalcogen photo/semiconductors-preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling, epitaxy, diffusion, ion implantation) - Semiconductor devices (p-n junction diode as rectifier, junction transistor).

Insulators & magnetic materials: electrical insulators-ferro and ferri magnetism-Hall effect and its applications.

Part II:

Nano materials:- Introduction-sol-gel method- characterization by BET, SEM and TEM methods-applications of graphene-carbon nanotubes and fullerenes: Types, preparation and applications

Liquid crystals:- Introduction-types-applications.

*Super conductors:-*Type –I, Type II-characteristics and applications

Learning Outcomes: *At the end of this unit, the students will be able to*

- *Understand* the importance of materials like nanomaterials and fullerenes and their uses.
- *Understand* liquid crystals and superconductors.
- *Understand* the preparation of semiconductors.

UNIT IV: Advanced Concepts/Topics in Chemistry

Computational chemistry: Introduction, Ab Initio studies

Molecular switches: characteristics of molecular motors and machines, Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid-base controlled molecular shuttle, a molecular elevator, an autonomous light-powered molecular motor

Learning Outcomes: *At the end of this unit, the students will be able to*

- *Obtain* the knowledge of computational chemistry
- *Understand* importance molecular machines

UNIT V: Spectroscopic Techniques & Non Conventional Energy Sources

Part A: SPECTROSCOPIC TECHNIQUES

Electromagnetic spectrum-UV (laws of absorption, instrumentation, theory of electronic spectroscopy, Frank-condon principle, chromophores and auxochromes, intensity shifts, applications), FT-IR (instrumentation and IR of some organic compounds, applications)-magnetic resonance imaging and CT scan (procedure & applications).

Part B: NON CONVENTIONAL ENERGY SOURCES

Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, tidal and wave power, ocean thermal energy conversion.

Learning Outcomes: *At the end of this unit, the students will be able to*

- understand the principles of different analytical instruments.
- explain the different applications of analytical instruments.



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- design sources of energy by different natural sources.

Text Books:

- 1) Engineering Chemistry by Jain and Jain; Dhanpat Rai Publishing Co.

Reference Books:

- 1) Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2019 edition.



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I Year - I Semester		L	T	P	C
		3	0	0	3
FUNDAMENTALS OF COMPUTER SCIENCE (ES1112)					

Course Objectives:

This course is designed to:

- Explain the concepts of computers and classify based on type and generation.
- Demonstrate the techniques of writing algorithms pseudo codes & schematic flow of logic in software development process.
- Teach about the purpose of networks and types of networks and media to connect the computers
- Teach about Operating Systems and its concepts.
- Illustrate about database architecture and its components
- Illustrate about distributed computing, peer to peer, grid, cloud on demand and utility computing.

Course Outcomes:

On completion of the course the student will be able to

- Illustrate the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming.
- Recognize the Computer networks, types of networks and topologies.
- Summarize the concepts of Operating Systems and Databases.
- Recite the Advanced Computer Technologies like Distributed Computing & Wireless Networks.

UNIT I

A Simple Computer System: Central processing unit, the further need of secondary storage, Types of memory, Hardware, Software and people.

Peripheral Devices: Input, Output and storage, Data Preparation, Factors affecting input, Input devices, Output devices, Secondary devices, Communication between the CPU and Input/ Output devices. (Text Book 1)

UNIT II

Problem Solving and Programming: Algorithm development, Flowcharts, Looping, some programming features, Pseudo code, the one-zero game, some structured programming concepts, documents.

Programming Languages: Machine Language and assembly language, high -level and low level languages, Assemblers, Compilers, and Interpreters (Text Book 1)

UNIT III

Computer Networks: Introduction to computer Networks, Network topologies-Bus topology, star topology, Ring topology, Mesh topology, Hybrid topology, Types of Networks: Local area Network, Wide Area Networks, Metropolitan Networks, Campus/ Corporate Area Network, Personal Area Network, Network Devices- Hub, Repeater, Switch, Bridge, Router, Gateway, Network interface Card, Open System Inter connection Model (Text Book 2)

Operating systems: Introduction, Evolution of operating systems, Process Management- Process control block, Process operations, Process scheduling, Command Interpreter, Popular operating systems- Microsoft DOS, Microsoft Windows, UNIX and Linux. (Text Book 2)

UNIT IV



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Database Systems: File-Oriented Approach, Database-oriented Approach-Components of Database system, Advantages & Disadvantages of Database approach, Applications of Database systems, Database views, Three-schema architecture, Database models-Hierarchical model, Network Model, relational Model, Object-oriented Data Model, Components of database management systems, Retrieving Data through Queries (Text Book 2)

Computer Systems and Development: Investigation, Analysis, Design, system processing and general program design, Presentation to management and users, Implementation, Documents. (Text Book 1)

UNIT V

Emerging Computer Technologies: Distributed Networking, Peer-to-peer Computing, Categorization of Peer-to-peer system Applications of Peer-to-peer networks, Grid Computing-components of Grid computing, Applications of Grid computing,, Cloud Computing-characteristics of cloud computing systems, cloud computing services, cloud computing architecture, cloud computing applications, Cloud computing concerns

Wireless Networks: Wireless network operations, Types of wireless networks, security in wireless Networks, Limitations of wireless Networks, Bluetooth – Bluetooth Piconets, Avoiding Interference in Bluetooth Devices, Bluetooth Security, Differences between Bluetooth and Wireless Networks. (Text Book 2)

Text Books:

1. An Introduction to Computer studies –Noel Kalicharan-Cambridge
2. Fundamentals of Computers –Reema Thareja-Oxford higher education

References Books:

1. Introduction to Information Technology – ITL education Solution Limited, Pearson
2. Computer Science and overview-J. Glenn Brookshear, Dennis Brylow-Pearson



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I Year - I Semester		L	T	P	C
		1	0	3	2.5
ENGINEERING DRAWING (ES1103)					

Course Objectives:

- Engineering drawing being the principal method of communication for engineers, the objective is to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

Course Outcomes:

- The student will learn how to visualize 2D & 3D objects.

UNIT I

Objective: To introduce the students to use drawing instruments and to draw polygons, Engg. Curves.

Polygons: Constructing regular polygons by general methods, inscribing and describing polygons on circles.

Curves: Parabola, Ellipse and Hyperbola by general and special methods, cycloids, involutes, tangents & normals for the curves.

Scales: Plain scales, diagonal scales and vernier scales

UNIT II

Objective: To introduce the students to use orthographic projections, projections of points & simple lines. To make the students draw the projections of the lines inclined to both the planes.

Orthographic Projections: Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines, line parallel to both the planes, line parallel to one plane and inclined to other plane.

Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces.

UNIT III

Objective: The objective is to make the students draw the projections of the plane inclined to both the planes.

Projections of planes: regular planes perpendicular/parallel to one reference plane and inclined to the other reference plane; inclined to both the reference planes.

UNIT IV

Objective: The objective is to make the students draw the projections of the various types of solids in different positions inclined to one of the planes.

Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to both the planes.

UNIT V

Objective: The objective is to represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.

Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer Aided Design, Drawing practice using Auto CAD, Creating 2D&3D drawings of objects



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using Auto CAD

Note: In the End Examination there will be no question from CAD.

Text Books:

- 1) Engineering Drawing by N.D. Butt, Chariot Publications
- 2) Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers

Reference Books:

- 1) Engineering Drawing by K.L.Narayana & P. Kannaiyah, Scitech Publishers
- 2) Engineering Graphics for Degree by K.C. John, PHI Publishers
- 3) Engineering Graphics by PI Varghese, McGrawHill Publishers
- 4) Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age



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I Year - I Semester		L	T	P	C
		0	0	3	1.5
ENGLISH LAB (HS1102)					

UNIT I

Vowels, Consonants, Pronunciation, Phonetic Transcription

UNIT II

Past tense markers, word stress-di-syllabic words, Poly-Syllabic words

UNIT III

Rhythm & Intonation

UNIT IV

Contrastive Stress (Homographs)

UNIT V

Word Stress: Weak and Strong forms

Stress in compound words

References books:

- 1) Infotech English, Maruthi Publications (with Compact Disc).
- 2) Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
- 3) English Pronunciation in use- Mark Hancock, Cambridge University Press.
- 4) English Phonetics and Phonology-Peter Roach, Cambridge University Press.
- 5) English Pronunciation in use- Mark Hewings, Cambridge University Press.
- 6) English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
- 7) English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.



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I Year - I Semester		L	T	P	C
		0	0	3	1.5
APPLIED CHEMISTRY LAB (BS1107)					

Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions, volumetric titrations, quantitative analysis

1. Determination of HCl using standard Na_2CO_3 solution.
2. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.
3. Determination of Mn (II) using standard oxalic acid solution.
4. Determination of ferrous iron using standard $\text{K}_2\text{Cr}_2\text{O}_7$ solution.
5. Determination of copper (II) using standard hypo solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of iron (III) by a colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
9. Determination of the concentration of strong acid vs strong base (by conductometric method).
10. Determination of strong acid vs strong base (by potentiometric method).
11. Determination of Mg^{+2} present in an antacid.
12. Determination of CaCO_3 present in an egg shell.
13. Estimation of Vitamin C.
14. Determination of phosphoric content in soft drinks.
15. Adsorption of acetic acid by charcoal.
16. Preparation of nylon-6, 6 and Bakelite (demonstration only).

Of the above experiments at-least 10 assessment experiments should be completed in a semester.

Outcomes: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Reference Books

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.



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I Year - I Semester		L	T	P	C
		0	0	3	1.5
IT WORKSHOP (ES1105)					

Course Objectives:

The objective of IT Workshop is to

- Explain the internal parts of a computer, peripherals, I/O ports, connecting cables
- Demonstrate basic command line interface commands on Linux
- Teach the usage of Internet for productivity and self paced lifelong learning
- Describe about Compression, Multimedia and Antivirus tools
- Demonstrate Office Tools such as Word processors, Spreadsheets and Presentation tools

Course Outcomes:

Students should be able to:

- Assemble and disassemble components of a PC
- Construct a fully functional virtual machine, Summarize various Linux operating system commands,
- Secure a computer from cyber threats, Learn and practice programming skill in Github, Hackerrank, Codechef, HackerEarth etc.
- Recognize characters & extract text from scanned images, Create audio files and podcasts
- Create video tutorials and publishing, Use office tools for documentation, Build interactive presentations, Build websites, Create quizzes & analyze responses.

Computer Hardware:

Experiment 1: Identification of peripherals of a PC, Laptop, Server and Smart Phones: Prepare a report containing the block diagram along with the configuration of each component and its functionality, Input/ Output devices, I/O ports and interfaces, main memory, cache memory and secondary storage technologies, digital storage basics, networking components and speeds.

Operating Systems:

Experiment 2: Virtual Machine setup:

- Setting up and configuring a new Virtual Machine
- Setting up and configuring an existing Virtual Machine
- Exporting and packaging an existing Virtual Machine into a portable format

Experiment 2: Operating System installation:

- Installing an Operating System such as Linux on Computer hardware.

Experiment 3: Linux Operating System commands:

- General command syntax
- Basic *help* commands
- Basic File system commands
- Date and Time
- Basic Filters and Text processing
- Basic File compression commands



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- Miscellaneous: apt-get, vi editor

Networking and Internet:

Experiment 4: Networking Commands:

- ping, ssh, ifconfig, scp, netstat, ipstat, nslookup, traceroute, telnet, host, ftp, arp, wget, route

Experiment 5: Internet Services:

- Web Browser usage and advanced settings like LAN, proxy, content, privacy, security, cookies, extensions/ plugins
- Antivirus installation, configuring a firewall, blocking pop-ups
- Email creation and usage, Creating a Digital Profile on LinkedIn
- Source control on Github, Hackerrank, Codechef, HackerEarth, etc
- Google hangout/ Skype/ gotomeeting video conferencing
- archive.org for accessing archived resources on the web

Productivity Tools:

Experiment 6: Demonstration and Practice on archival and compression tools

- scanning and image editing tools
- OCR and text extraction
- audio players, recording using Mic, editing, podcast preparation
- video players, recording using webcam/camcorder, editing
- podcast, screencast, vodcast, webcasting

Office Tools:

Experiment 7: Demonstration and Practice on Text Editors like Notepad++, Sublime Text, Atom, Brackets, Visual code, etc

Experiment 8: Demonstration and practice on Microsoft Word, Power Point

Experiment 9: Demonstration and practice on Microsoft Excel.

Experiment 10: Demonstration and practice on LaTeX and produce professional pdf documents.

Experiment 12: Cloud based productivity enhancement and collaboration tools:

- Store, sync, and share files with ease in the cloud using Google Drive
- Document creation and editing text documents in your web browser using Google docs
- Handle task lists, create project plans, analyze data with charts and filters using Google Sheets
- Create pitch decks, project presentations, training modules using Google Slides
- Manage event registrations, create quizzes, analyze responses using Google Forms
- Build public sites, internal project hubs using Google Sites
- Online collaboration through cross-platform support using Jamboard
- Keep track of important events, sharing one's schedule, and create multiple calendars using Google Calendar

Text Books:

- 1) Computer Fundamentals, Anita Goel, Pearson Education, 2017
- 2) PC Hardware Trouble Shooting Made Easy, TMH



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References Books:

- 1) Essential Computer and IT Fundamentals for Engineering and Science Students,
Dr.N.B.Vekateswarlu, S.Chand

e-Resources:

- 1) https://explorersposts.grc.nasa.gov/post631/2006-2007/computer_basics/ComputerPorts.doc
- 2) <https://explorersposts.grc.nasa.gov/post631/2006-2007/bitsnbyte/Digital Storage Basics.doc>
- 3) <https://www.thegeekstuff.com/2009/07/linux-ls-command-examples>
- 4) <https://www.pcsuggest.com/basic-linux-commands/>
- 5) <https://www.vmware.com/pdf/VMwarePlayerManual10.pdf>
- 6) <https://geek-university.com/vmware-player/manually-install-a-guest-operating-system/>
- 7) <https://gsuite.google.com/learning-center/products/#!/>



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I Year - I Semester		L	T	P	C
		3	0	0	0
ENVIRONMENTAL SCIENCE (MC1101)					

Course Objectives:

The objectives of the course are to impart:

- Overall understanding of the natural resources.
- Basic understanding of the ecosystem and its diversity.
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
- An understanding of the environmental impact of developmental activities.
- Awareness on the social issues, environmental legislation and global treaties.

UNIT I

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance –Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information technology in environment and human health.

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT II

Natural Resources: Natural resources and associated problems.

Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.

Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.

Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

UNIT III

Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.



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UNIT IV

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT V

Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics. The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

Text Books:

- 1) Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
- 2) Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
- 3) Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

Reference Books:

- 1) Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
- 2) A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
- 3) Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
- 4) Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014



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I Year - II Semester		L	T	P	C
		3	0	0	3
MATHEMATICS - II (BS1202)					

Course Objectives:

- To instruct the concept of Matrices in solving linear algebraic equations
- To elucidate the different numerical methods to solve nonlinear algebraic equations
- To disseminate the use of different numerical techniques for carrying out numerical integration.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Course Outcomes:

At the end of the course, the student will be able to

- develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)
- solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel (L3)
- evaluate approximating the roots of polynomial and transcendental equations by different algorithms (L5)
- apply Newton’s forward & backward interpolation and Lagrange’s formulae for equal and unequal intervals (L3)
- apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations (L3)

UNIT I: Solving systems of linear equations, Eigen values and Eigen vectors: (10 hrs)

Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non-homogeneous equations linear equations – Gauss Elimination for solving system of equations – Eigen values and Eigen vectors and their properties.

UNIT-II: Cayley-Hamilton theorem and Quadratic forms: (10 hrs)

Cayley - Hamilton theorem (without proof) – Finding inverse and power of a matrix by Cayley-Hamilton theorem – Reduction to Diagonal form – Quadratic forms and nature of the quadratic forms – Reduction of quadratic form to canonical forms by orthogonal transformation. Singular values of a matrix, singular value decomposition (Ref. Book – 1).

UNIT III: Iterative methods: (8 hrs)

Introduction – Bisection method – Secant method – Method of false position – Iteration method – Newton-Raphson method (One variable and simultaneous Equations) – Jacobi and Gauss-Seidel methods for solving system of equations.

UNIT IV: Interpolation: (10 hrs)

Introduction – Errors in polynomial interpolation – Finite differences – Forward differences – Backward differences – Central differences – Relations between operators – Newton’s forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange’s interpolation formula –



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Newton's divide difference formula.

UNIT V: Numerical integration and solution of ordinary differential equations: (10 hrs)

Trapezoidal rule – Simpson's $1/3^{\text{rd}}$ and $3/8^{\text{th}}$ rule – Solution of ordinary differential equations by Taylor's series – Picard's method of successive approximations – Euler's method – Runge-Kutta method (second and fourth order).

Text Books:

- 1) B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
- 2) B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

- 1) David Poole, Linear Algebra- A modern introduction, 4th Edition, Cengage.
- 2) Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineering and Science, Tata Mc. Graw Hill Education.
- 3) M. K. Jain, S. R. K. Iyengar and R. K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
- 4) Lawrence Turyn, Advanced Engineering Mathematics, CRC Press.



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I Year - II Semester		L	T	P	C
		3	0	0	3
MATHEMATICS - III (BS1203)					

Course Objectives:

- To familiarize the techniques in partial differential equations
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

Course Outcomes:

At the end of the course, the student will be able to

- Interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
- Estimate the work done against a field, circulation and flux using vector calculus (L5)
- Apply the Laplace transform for solving differential equations (L3)
- Find or compute the Fourier series of periodic signals (L3)
- Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)
- Identify solution methods for partial differential equations that model physical processes (L3)

UNIT I: Vector calculus: (10 hrs)

Vector Differentiation: Gradient – Directional derivative – Divergence – Curl – Scalar Potential.

Vector Integration: Line integral – Work done – Area – Surface and volume integrals – Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof).

UNIT II: Laplace Transforms: (10 hrs)

Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Unit step function – Dirac’s delta function – Inverse Laplace transforms – Convolution theorem (without proof).

Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

UNIT III: Fourier series and Fourier Transforms: (10 hrs)

Fourier Series: Introduction – Periodic functions – Fourier series of periodic function – Dirichlet’s conditions – Even and odd functions – Change of interval – Half-range sine and cosine series.

Fourier Transforms: Fourier integral theorem (without proof) – Fourier sine and cosine integrals – Sine and cosine transforms – Properties – inverse transforms – Finite Fourier transforms.

UNIT IV: PDE of first order: (8 hrs)

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

UNIT V: Second order PDE and Applications: (10 hrs)

Second order PDE: Solutions of linear partial differential equations with constant coefficients – RHS term of the type e^{ax+by} , $\sin(ax + by)$, $\cos(ax + by)$, $x^m y^n$.

Applications of PDE: Method of separation of Variables – Solution of One dimensional Wave, Heat and two-dimensional Laplace equation.



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Text Books:

- 1) B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
- 2) B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

- 1) Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India.
- 2) Dean. G. Duffy, Advanced Engineering Mathematics with MATLAB, 3rd Edition, CRC Press.
- 3) Peter O' Neil, Advanced Engineering Mathematics, Cengage.
- 4) Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.



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I Year - II Semester		L	T	P	C
		3	0	0	3
APPLIED PHYSICS (BS1204)					

Course Objectives:

Physics curriculum which is re-oriented to the needs of Circuital branches of graduate engineering courses offered by Jawaharlal Nehru Technological University Kakinada that serves as a transit to understand the branch specific advanced topics. The course is designed to:

- Impart Knowledge of Physical Optics phenomena like Interference and Diffraction required to design instruments with higher resolution.
- Understand the physics of Semiconductors and their working mechanism for their utility in sensors.
- To impart the knowledge of materials with characteristic utility in appliances.

UNIT I

(10hrs)

WAVE OPTICS: Principle of Superposition - Interference of light - Conditions for sustained Interference - Interference in thin films (reflected geometry) - Newton’s Rings (reflected geometry).

Diffraction - Fraunhofer Diffraction - Diffraction due to Single slit (quantitative), Double slit, N -slits and circular aperture (qualitative) – Intensity distribution curves - Diffraction Grating – Grating spectrum – missing order – resolving power – Rayleigh’s criterion – Resolving powers of Microscope, Telescope and grating (qualitative).

Unit Outcomes: *The students will be able to*

- explain the need of coherent sources and the conditions for sustained interference.
- analyze the differences between interference and diffraction with applications.
- illustrate the resolving power of various optical instruments.

UNIT II

(9hrs)

QUANTUM MECHANICS: Introduction – Matter waves – de Broglie’s hypothesis – Davisson-Germer experiment – G. P. Thomson experiment – Heisenberg’s Uncertainty Principle –interpretation of wave function – Schrödinger Time Independent and Time Dependent wave equations – Particle in a potential box.

Unit Outcomes: *The students will be able to*

- explain the fundamental concepts of quantum mechanics.
- analyze the physical significance of wave function.
- apply Schrödinger’s wave equation for energy values of a free particle .

UNIT III

(10hrs)

FREE ELECTRON THEORY & BAND THEORY OF SOLIDS : Introduction – Classical free electron theory (merits and demerits only) - Quantum Free electron theory – electrical conductivity based on quantum free electron theory – Fermi Dirac distribution function – Temperature dependence of Fermi-Dirac distribution function - expression for Fermi energy -Density of states.

Bloch’s theorem (qualitative) – Kronig-Penney model(qualitative) – energy bands in crystalline solids – E Vs K diagram – classification of crystalline solids – effective mass of electron – m^* Vs K diagram - concept of hole.



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Unit Outcomes: *The students will be able to*

- explain the various electron theories.
- calculate the Fermi energy.
- analyze the physical significance of wave function .
- interpret the effects of temperature on Fermi Dirac distribution function.
- summarise various types of solids based on band theory.

UNIT IV

(9hrs)

SEMICONDUCTOR PHYSICS: Introduction – Intrinsic semi conductors - density of charge carriers - Electrical conductivity – Fermi level – extrinsic semiconductors - p-type & n-type - Density of charge carriers - Dependence of Fermi energy on carrier concentration and temperature – Hall effect- Hall coefficient - Applications of Hall effect - Drift and Diffusion currents – Einstein’s equation.

Learning Outcomes: *The students will be able to*

- classify the energy bands of semiconductors.
- outline the properties of n-type and p-type semiconductors.
- identify the type of semiconductor using Hall effect.

UNIT V

(10 hrs)

MAGNETISM & DIELECTRICS: Introduction – Magnetic dipole moment – Magnetization – Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Bohr magneton – Classification of magnetic materials: Dia, para & Ferro – Domain concept of Ferromagnetism - Hysteresis – soft and hard magnetic materials – applications of Ferromagnetic material.

Introduction - Dielectric polarization – Dielectric Polarizability, Susceptibility and Dielectric constant- types of polarizations: Electronic and Ionic (Quantitative), Orientational polarizations (qualitative) – Lorentz Internal field – Claussius-Mossoti equation - Frequency dependence of polarization – Applications of dielectrics.

Unit Outcomes: *The students will be able to*

- explain the concept of polarization in dielectric materials.
- summarize various types of polarization of dielectrics .
- interpret Lorentz field and Claussius- Mosotti relation in dielectrics.
- classify the magnetic materials based on susceptibility and their temperature dependence.
- explain the applications of dielectric and magnetic materials .
- Apply the concept of magnetism to magnetic devices.

Text Books:

- 1) “A Text book of Engineering Physics” by M.N. Avadhanulu, P.G.Kshirsagar - S.Chand Publications, 2017.
- 2) “Engineering Physics” by D.K.Bhattacharya and Poonam Tandon, Oxford press (2015).
- 3) “Engineering Physics” by R.K Gaur. and S.L Gupta., - Dhanpat Rai publishers, 2012.

Reference Books:

- 1) “Engineering Physics” by M. R. Srinivasan, New Age international publishers (2009).
- 2) “Optics” by Ajoy Ghatak, 6th Edition McGraw Hill Education, 2017.
- 3) “Solid State Physics” by A. J. Dekker, Mc Millan Publishers (2011).



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I Year - II Semester		L	T	P	C
		3	0	0	3
PROGRAMMING FOR PROBLEM SOLVING USING C (ES1201)					

Course Objectives:

The objectives of Programming for Problem Solving Using C are

- To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
- To gain knowledge of the operators, selection, control statements and repetition in C
- To learn about the design concepts of arrays, strings, enumerated structure and union types. To learn about their usage.
- To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor.
- To assimilate about File I/O and significance of functions

Course Outcomes:

Upon the completion of the course the student will learn

- To write algorithms and to draw flowcharts for solving problems
- To convert flowcharts/algorithms to C Programs, compile and debug programs
- To use different operators, data types and write programs that use two-way/ multi-way selection
- To select the best loop construct for a given problem
- To design and implement programs to analyze the different pointer applications
- To decompose a problem into functions and to develop modular reusable code
- To apply File I/O operations

UNIT I

Introduction to Computers: Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers

Introduction to the C Language: Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers.

Structure of a C Program: Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.

UNIT II

Bitwise Operators: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators.

Selection & Making Decisions: Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions.

Repetition: Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples.

UNIT III

Arrays: Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Example – Calculate Averages

Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code



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Enumerated, Structure, and Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application.

UNIT IV

Pointers: Introduction, Pointers to pointers, Compatibility, L value and R value

Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application.

Processor Commands: Processor Commands.

UNIT V

Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter-Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers to Functions, Recursion

Text Input / Output: Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions

Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.

Text Books:

- 1) Programming for Problem Solving, Behrouz A. Forouzan, Richard F. Gilberg, CENGAGE.
- 2) The C Programming Language, Brian W. Kernighan, Dennis M. Ritchie, 2e, Pearson.

Reference Books:

- 1) Computer Fundamentals and Programming, Sumithabha Das, Mc Graw Hill.
- 2) Programming in C, Ashok N. Kamthane, Amit Kamthane, Pearson.
- 3) Computer Fundamentals and Programming in C, Pradip Dey, Manas Ghosh, OXFORD.

I Year - II Semester		L	T	P	C
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		3	0	0	3
DIGITAL LOGIC DESIGN (ES1213)					

Course objectives:

- To study the basic philosophy underlying the various number systems, negative number representation, binary arithmetic, theory of Boolean algebra and map method for minimization of switching functions.
- To introduce the basic tools for design of combinational and sequential digital logic.
- To learn simple digital circuits in preparation for computer engineering.

Course outcomes:

A student who successfully fulfills the course requirements will have demonstrated:

- An ability to define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.
- An ability to understand the different switching algebra theorems and apply them for logic functions.
- An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions.
- Students will be able to design various logic gates starting from simple ordinary gates to complex programmable logic devices & arrays.
- Students will be able to design various sequential circuits starting from flip-flop to registers and counters.

UNIT I: Digital Systems and Binary Numbers

Digital Systems, Binary Numbers, Octal and Hexadecimal Numbers, Complements of Numbers, Signed Binary Numbers, Arithmetic addition and subtraction, 4-bit codes: BCD, EXCESS 3, alphanumeric codes, 9's complement, 2421, etc.

UNIT II: Concept of Boolean algebra

Basic Theorems and Properties of Boolean algebra, Boolean Functions, Canonical and Standard Forms, Minterms and Maxterms.

Gate level Minimization

Map Method, Three-Variable K-Map, Four Variable K-Maps. Products of Sum Simplification, Sum of Products Simplification, Don't – Care Conditions, NAND and NOR Implementation, ExclusiveOR Function.

UNIT III: Combinational Logic

Introduction, Analysis Procedure, Binary Adder–Subtractor, Binary Multiplier, Decoders, Encoders, Multiplexers, Demultiplexers, Priority Encoder, Code Converters, Magnitude Comparator, HDL Models of Combinational Circuits.

Realization of Switching Functions Using PROM, PAL and PLA.

UNIT IV: Synchronous Sequential Logic

Introduction to Sequential Circuits, Storage Elements: Latches, Flip-Flops, RS- Latch Using NAND and NOR Gates, Truth Tables. RS, JK, T and D Flip Flops, Truth and Excitation Tables, Conversion of Flip Flops.

UNIT V: Registers and Counters



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Registers, Shift Registers, Ripple Counters, Synchronous Counters, Ring Counter, Johnson Counter.

Text Books:

- 1) Digital Design, 5/e, M.Morris Mano, Michael D Ciletti, PEA.
- 2) Fundamentals of Logic Design, 5/e, Roth, Cengage.

Reference Books:

- 1) Digital Logic and Computer Design, M.Morris Mano, PEA.
- 2) Digital Logic Design, Leach, Malvino, Saha, TMH.
- 3) Modern Digital Electronics, R.P. Jain, TMH.



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I Year - II Semester		L	T	P	C
		0	0	3	1.5
APPLIED PHYSIC LAB (ES1205)					

(Any 10 of the following listed 15 experiments)

LIST OF EXPERIMENTS:

- 1) Determination of wavelength of a source-Diffraction Grating-Normal incidence.
- 2) Newton's rings – Radius of Curvature of Plano - Convex Lens.
- 3) Determination of thickness of a spacer using wedge film and parallel interference fringes.
- 4) Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
- 5) Energy Band gap of a Semiconductor p - n junction.
- 6) Characteristics of Thermistor – Temperature Coefficients
- 7) Determination of dielectric constant by charging and discharging method
- 8) Determination of resistivity of semiconductor by Four probe method.
- 9) Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
- 10) Measurement of magnetic susceptibility by Gouy's method.
- 11) Dispersive power of diffraction grating.
- 12) Resolving Power of telescope
- 13) Resolving power of grating
- 14) Determination of Hall voltage and Hall coefficients of a given semiconductor using Hall effect.
- 15) Variation of dielectric constant with temperature.



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I Year - II Semester	L	T	P	C
	0	1	2	2
COMMUNICATION SKILLS LAB (HS1203)				

UNIT I

Oral Activity: JAM, Hypothetical Situations, Self/Peer Profile
Common Errors in Pronunciation, Neutralising Accent

UNIT II

Oral Activity: Telephonic Etiquette, Role Plays
Poster Presentations

UNIT III

Oral Activity: Oral Presentation skills, Public speaking
Data Interpretation

UNIT IV

Oral Activity: Group Discussions: Do's and Don'ts- Types, Modalities

UNIT V

Oral Activity: Interview Skills: Preparatory Techniques, Frequently asked questions, Mock Interviews.
Pronunciation: Connected speech (Pausing, Tempo, Tone, Fluency etc.,)

References:

- 1) Infotech English, Maruthi Publications (with Compact Disc).
- 2) Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
- 3) English Pronunciation in use- Mark Hancock, Cambridge University Press.
- 4) English Phonetics and Phonology-Peter Roach, Cambridge University Press.
- 5) English Pronunciation in use- Mark Hewings, Cambridge University Press.
- 6) English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
- 7) English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.
- 8) Technical Communication- Meenakshi Raman, Sangeeta Sharma, Oxford University Press.
- 9) Technical Communication- Gajendra Singh Chauhan, Smita Kashiramka, Cengage Publications.



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I Year - II Semester		L	T	P	C
		0	0	3	1.5
PROGRAMMING FOR PROBLEM SOLVING USING C LAB (ES1202)					

Course Objectives:

- Apply the principles of C language in problem solving.
- To design flowcharts, algorithms and knowing how to debug programs.
- To design & develop of C programs using arrays, strings pointers & functions.
- To review the file operations, preprocessor commands.

Course Outcomes:

By the end of the Lab, the student

- Gains Knowledge on various concepts of a C language.
- Able to draw flowcharts and write algorithms.
- Able design and development of C problem solving skills.
- Able to design and develop modular programming skills.
- Able to trace and debug a program

Exercise 1:

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.
3. Write a C program to display multiple variables.

Exercise 2:

1. Write a C program to calculate the distance between the two points.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3:

1. Write a C program to convert a string to a long integer.
2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.
3. Write a C program to calculate the factorial of a given number.

Exercise 4:

1. Write a program in C to display the n terms of even natural number and their sum.
2. Write a program in C to display the n terms of harmonic series and their sum.
 $1 + 1/2 + 1/3 + 1/4 + 1/5 \dots 1/n$ terms.
3. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5:

1. Write a program in C to print all unique elements in an array.
2. Write a program in C to separate odd and even integers in separate arrays.
3. Write a program in C to sort elements of array in ascending order.



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Exercise 6:

1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a given matrix.

Exercise 7:

1. Write a program in C to search an element in a row wise and column wise sorted matrix.
2. Write a program in C to print individual characters of string in reverse order.

Exercise 8:

1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to another string.

Exercise 9:

1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:

1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.
2. Write a program in C to add two numbers using pointers.

Exercise 11:

1. Write a program in C to add numbers using call by reference.
2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:

1. Write a program in C to swap elements using call by reference.
2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13:

1. Write a program in C to show how a function returning pointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc() function.

Exercise 14:

1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc() function. Understand the difference between the above two programs
2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15:

1. Write a program in C to check whether a number is a prime number or not using the function.
2. Write a program in C to get the largest element of an array using the function.

Exercise 16:

1. Write a program in C to append multiple lines at the end of a text file.
2. Write a program in C to copy a file in another name.
3. Write a program in C to remove a file from the disk.



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I Year - II Semester		L	T	P	C
		0	0	2	1
ENGINEERING EXPLORATION PROJECT (PR1201)					

Course Objectives:

- Build mindsets & foundations essential for designers
- Learn about the Human-Centered Design methodology and understand their real-world applications
- Use Design Thinking for problem solving methodology for investigating illdefined problems.
- Undergo several design challenges and work towards the final design challenge

Apply Design Thinking on the following Streams to

- Project Stream 1: Electronics, Robotics, IOT and Sensors
- Project Stream 2: Computer Science and IT Applications
- Project Stream 3: Mechanical and Electrical tools
- Project Stream4: Eco-friendly solutions for waste management, infrastructure, safety, alternative energy sources, Agriculture, Environmental science and other fields of engineering.

HOW TO PURSUE THE PROJECT WORK?

- The first part will be learning-based-making students to embrace the methodology by exploring all the phases of design thinking through the wallet/ bag challenge and podcasts.
- The second part will be more discussion-based and will focus on building some necessary skills as designers and learning about complementary material for human- centered design.
- The class will then divide into teams and they will be working with one another for about 2 – 3 weeks. These teams and design challenges will be the basis for the final project and final presentation to be presented.
- The teams start with **Design Challenge** and go through all the phases more in depth from coming up with the right question to empathizing to ideating to prototyping and to testing.
- Outside of class, students will also be gathering the requirements, identifying the challenges, usability, importance etc
- At the end, Students are required to submit the final reports, and will be evaluated by the faculty.

TASKS TO BE DONE:

Task 1: Everyone is a Designer

- Understand class objectives & harness the designer mindset

Task 2: The Wallet/Bag Challenge and Podcast

- Gain a quick introduction to the design thinking methodology
- Go through all stages of the methodology through a simple design challenge
- Podcast: Observe, Listen and Engage with the surrounding environment and identify a design challenge.

Task 3: Teams & Problems

- Start Design Challenge and learn about teams & problems through this
- Foster team collaboration, find inspiration from the environment and learn how to identify problems



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Task 4: Empathizing

- Continue Design Challenge and learn empathy
- Learn techniques on how to empathize with users
- Go to the field and interview people in their environments
- Submit Activity Card

Task 5: Ideating

- Continue Design Challenge and learn how to brainstorm effectively
- Encourage exploration and foster spaces for brainstorming
- Submit Activity Card

Task 6: Prototyping

- Continue Design Challenge and learn how to create effective prototypes
- Build tangible models and use them as communication tools
- Start giving constructive feedback to classmates and teammates
- Submit Activity Card

Task 7: Testing

- Finish Design Challenge and iterate prototypes and ideas through user feedback
- Evolve ideas and prototypes through user feedback and constructive criticism
- Get peer feedback on individual and group performance
- Submit Activity Card

Task 8:

- Final Report Submission and Presentation

Note: The colleges may arrange for Guest Speakers from Various Design Fields: Graphic Design, Industrial Design, Architecture, Product Design, Organizational Design, etc to enrich the students with Design Thinking Concept.

References:

1. Tom Kelly, *The Art of Innovation: Lessons in Creativity From IDEO, America’s Leading Design Firm* (Profile Books, 2002)
2. Tim Brown, *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation* (HarperBusiness, 2009)
3. Jeanne Liedtka, Randy Salzman, and Daisy Azer, *Design Thinking for the Greater Good: Innovation in the Social Sector* (Columbia Business School Publishing, 2017)

Other Useful Design Thinking Frameworks and Methodologies:

- Human-Centered Design Toolkit (IDEO); <https://www.ideo.com/post/design-kit>
- Design Thinking Boot Camp Bootleg (Stanford D-School); <https://dschool.stanford.edu/resources/the-bootcamp-bootleg>
- Collective Action Toolkit (frogdesign); https://www.frogdesign.com/wpcontent/uploads/2016/03/CAT_2.0_English.pdf
- Design Thinking for Educators (IDEO); <https://designthinkingforeducators.com/>

I Year - II Semester	L	T	P	C
	3	0	0	0



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CONSTITUTION OF INDIA (MC1204)

Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative

Course Outcomes:

At the end of the course, the student will be able to have a clear knowledge on the following:

- Understand historical background of the constitution making and its importance for building a democratic India.
- Understand the functioning of three wings of the government i.e., executive, legislative and judiciary.
- Understand the value of the fundamental rights and duties for becoming good citizen of India.
- Analyze the decentralization of power between central, state and local self-government.
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.
 1. Know the sources, features and principles of Indian Constitution.
 2. Learn about Union Government, State government and its administration.
 3. Get acquainted with Local administration and Panchayati Raj.
 4. Be aware of basic concepts and developments of Human Rights.
 5. Gain knowledge on roles and functioning of Election Commission

UNIT I

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Learning outcomes: After completion of this unit student will

- Understand the concept of Indian constitution
- Apply the knowledge on directive principle of state policy
- Analyze the History, features of Indian constitution
- Evaluate Preamble Fundamental Rights and Duties

UNIT II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions;

Learning outcomes: After completion of this unit student will

- Understand the structure of Indian government
- Differentiate between the state and central government
- Explain the role of President and Prime Minister
- Know the Structure of supreme court and High court

UNIT III



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State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

Learning outcomes: After completion of this unit student will

- Understand the structure of state government
- Analyze the role Governor and Chief Minister
- Explain the role of state Secretariat
- Differentiate between structure and functions of state secretariat

UNIT IV

A. Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation Pachayati Raj: Functions PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy

Learning outcomes:-After completion of this unit student will

- Understand the local Administration
- Compare and contrast district administration role and importance
- Analyze the role of Mayor and elected representatives of Municipalities
- Evaluate Zilla Panchayat block level organisation

UNIT V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

Learning outcomes: After completion of this unit student will

- Know the role of Election Commission apply knowledge
- Contrast and compare the role of Chief Election commissioner and Commissionerate
- Analyze role of state election commission
- Evaluate various commissions of viz SC/ST/OBC and women

References:

- 1) Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India Pvt. Ltd.
- 2) Subash Kashyap, Indian Constitution, National Book Trust
- 3) J.A. Siwach, Dynamics of Indian Government & Politics
- 4) D.C. Gupta, Indian Government and Politics
- 5) H.M. Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
- 6) J.C. Johari, Indian Government and Politics Hans
- 7) J. Raj Indian Government and Politics
- 8) M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
- 9) Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

e-Resources:

- 1) nptel.ac.in/courses/109104074/8
- 2) nptel.ac.in/courses/109104045/
- 3) nptel.ac.in/courses/101104065/



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- 4) www.hss.iitb.ac.in/en/lecture-details
- 5) www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

II Year – I Semester	L	T	P	C
	3	0	0	3



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DISCRETE MATHEMATICAL STRUCTURES

Course Objectives:

- To introduce the students to the topics and techniques of discrete methods and combinatorial reasoning
- To introduce a wide variety of applications. The algorithmic approach to the solution of problems is fundamental in discrete mathematics, and this approach reinforces the close ties between this discipline and the area of computer science

Course Outcomes:

At the end of the course student will be able to

- Demonstrate skills in solving mathematical problems
- Comprehend mathematical principles and logic
- Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software
- Manipulate and analyze data numerically and/or graphically using appropriate Software

UNIT I

Mathematical Logic: Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof, Predicate Calculus: Predicates, Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.

UNIT II

Set Theory: Sets: Operations on Sets, Principle of Inclusion-Exclusion, Relations: Properties, Operations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering, Hasse Diagrams, Functions: Bijective, Composition, Inverse, Permutation, and Recursive Functions, Lattice and its Properties, Algebraic Structures: Algebraic Systems, Properties, Semi Groups and Monoids, Group, Subgroup and Abelian Group, Homomorphism, Isomorphism.

UNIT III

Combinatorics: Basis of Counting, Permutations, Permutations with Repetitions, Circular and Restricted Permutations, Combinations, Restricted Combinations, Binomial and Multinomial Coefficients and Theorems, Number Theory: Properties of Integers, Division Theorem, Greatest Common Divisor, Euclidean

Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic, Fermat's and Euler's Theorems

UNIT IV

Recurrence Relations: Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations

UNIT-V



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Graph Theory: Basic Concepts, Graph Theory and its Applications, Sub graphs, Graph Representations: Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Bipartite and Planar Graphs, Euler's Theorem, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Prim's and Kruskal's Algorithms, BFS and DFS Spanning Trees

Text Books:

- 1) Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.
- 2) Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill.
- 3) Theory and Problems of Discrete Mathematics, Schaum's Outline Series, Seymour Lipschutz and Marc Lars Lipson, 3rd Edition, McGraw Hill.

Reference Books:

- 1) Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India.
- 2) Discrete Mathematical Structures, Bernard Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
- 3) Discrete Mathematics, S. K. Chakraborty and B.K. Sarkar, Oxford, 2011.
- 4) Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.



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II Year – I Semester		L	T	P	C
		3	0	0	3
PRINCIPLES OF SOFTWARE ENGINEERING					

Course Objectives:

This course is designed to:

- Give exposure to phases of Software Development, common process models including Waterfall, and the Unified Process, and hands-on experience with elements of the agile process
- Give exposure to a variety of Software Engineering practices such as requirements analysis and specification, code analysis, code debugging, testing, traceability, and version control
- Give exposure to Software Design techniques

Course Outcomes:

Students taking this subject will gain software engineering skills in the following areas:

- Transform an Object-Oriented Design into high quality, executable code
- Skills to design, implement, and execute test cases at the Unit and Integration level
- Compare conventional and agile software methods

UNIT I

The Nature of Software, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths, How It All Starts. A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology.

UNIT II

Agility, Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, A Tool Set for the Agile Process, Software Engineering Knowledge, Core Principles, Principles That Guide Each Framework Activity, Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

UNIT III

Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling, Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modelling, Requirements Modeling for WebApps.

UNIT IV

Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model, Software Architecture, Architectural Genres, Architectural Styles, Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow, What Is a Component?, Designing Class-Based Components, Conducting Component-Level Design, Component-Level Design for WebApps, Designing Traditional Components, Component-Based Development.



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UNIT V

The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, WebApp Interface Design, Design Evaluation, Elements of Software Quality Assurance, SQA Tasks, Goals & Metrics, Statistical SQA, Software Reliability, A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, Validation Testing, System Testing, The Art of Debugging, Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basis Path Testing

Text Books:

- 1) Software Engineering a practitioner's approach, Roger S. Pressman, Seventh Edition, McGraw Hill Higher Education.
- 2) Software Engineering, Ian Sommerville, Ninth Edition, Pearson.

Reference Books:

- 1) Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India, 2010.
- 2) Software Engineering, Ugrasen Suman, Cengage.

e-Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105182/>



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II Year – I Semester	L	T	P	C
	3	0	0	3
PYTHON PROGRAMMING				

Course Objectives:

The Objectives of Python Programming are

- To learn about Python programming language syntax, semantics, and the runtime environment
- To be familiarized with universal computer programming concepts like data types, containers
- To be familiarized with general computer programming concepts like conditional execution, loops & functions
- To be familiarized with general coding techniques and object-oriented programming

Course Outcomes:

- Develop essential programming skills in computer programming concepts like data types, containers
- Apply the basics of programming in the Python language
- Solve coding tasks related conditional execution, loops
- Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming

UNIT I

Introduction: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output.

Data Types, and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules.

Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.

UNIT II

Control Statement: Definite iteration for Loop Formatting Text for output, Selection if and if else Statement Conditional Iteration The While Loop

Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings and Number Systems, String Methods Text Files.

UNIT III

List and Dictionaries: Lists, Defining Simple Functions, Dictionaries

Design with Function: Functions as Abstraction Mechanisms, Problem Solving with Top Down Design, Design with Recursive Functions, Case Study Gathering Information from a File System, Managing a Program's Namespace, Higher Order Function

Modules: Modules, Standard Modules, Packages

UNIT IV



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File Operations: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations

Object Oriented Programming: Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance , overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using OOPS support

Design with Classes: Objects and Classes, Data modeling Examples, Case Study An ATM, Structuring Classes with Inheritance and Polymorphism

UNIT V

Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions

Graphical User Interfaces: The Behavior of Terminal Based Programs and GUI – Based, Programs , Coding Simple GUI-Based Programs, Other Useful GUI Resources

Programming: Introduction to Programming Concepts with Scratch

Text Books:

- 1) Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage
- 2) Python Programming: A Modern Approach, Vamsi Kurama, Pearson

Reference Books:

- 1) Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press
- 2) Introduction to Programming Using Python, Y. Daniel Liang, Pearson

e-Resources:

- 1) <https://www.python.org/>
- 2) https://www.tutorialspoint.com/python3/python_tutorial.pdf



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DEPARTMENT OF INFORMATION TECHNOLOGY

II Year – I Semester	L	T	P	C
	3	0	0	3
DATA STRUCTURES				

Course Objectives:

The objective of the course is to

- Introduce the fundamental concept of data structures and abstract data types
- Emphasize the importance of data structures in developing and implementing efficient algorithms
- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms

Course Outcomes:

After completing this course a student will be able to:

- Summarize the properties, interfaces, and behaviors of basic abstract data types
- Discuss the computational efficiency of the principal algorithms for sorting & searching
- Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writing programs
- Demonstrate different methods for traversing trees

UNIT I

Data Structures - Definition, Classification of Data Structures, Operations on Data Structures, Abstract Data Type (ADT), Preliminaries of algorithms, Time and Space complexity.

Searching - Linear search, Binary search, Fibonacci search.

Sorting- Insertion sort, Selection sort, Exchange (Bubble sort, quick sort), distribution (radix sort), merging (Merge sort) algorithms.

UNIT II

Linked List: Introduction, Single linked list, Representation of Linked list in memory, Operations on Single Linked list-Insertion, Deletion, Search and Traversal ,Reversing Single Linked list, Applications on Single Linked list- Polynomial Expression Representation ,Addition and Multiplication, Sparse Matrix Representation using Linked List, Advantages and Disadvantages of Single Linked list, Double Linked list-Insertion, Deletion, Circular Linked list-Insertion, Deletion.

UNIT III

Queues: Introduction to Queues, Representation of Queues-using Arrays and using Linked list, Implementation of Queues-using Arrays and using Linked list, Application of Queues-Circular Queues, Deques, Priority Queues, Multiple Queues.

Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on Stacks, Linked list Representation of Stacks, Operations on Linked Stack, Applications-Reversing list, Factorial Calculation, Infix to Postfix Conversion, Evaluating Postfix Expressions.



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UNIT IV

Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees using Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations: Insertion, Deletion, Tree Traversals, Applications-Expression Trees, Heap Sort, Balanced Binary Trees- AVL Trees, Insertion, Deletion and Rotations.

UNIT V

Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prims & Kruskals Algorithm, Dijkstra's shortest path, Transitive closure. Warshall's Algorithm,

Text Books:

- 1) Data Structures Using C. 2nd Edition. Reema Thareja, Oxford.
- 2) Data Structures and algorithm analysis in C, 2nded, Mark Allen Weiss.

Reference Books:

- 1) Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press.
- 2) Data Structures: A PseudoCode Approach, 2/e, Richard F. Gilberg, Behrouz A. Forouzon, Cengage.
- 3) Data Structures with C, Seymour Lipschutz TMH

e-Resources:

- 1) <http://algs4.cs.princeton.edu/home/>
- 2) https://faculty.washington.edu/jstraub/dsa/Master_2_7a.pdf



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DEPARTMENT OF INFORMATION TECHNOLOGY

II Year – I Semester	L	T	P	C
	3	0	0	3
COMPUTER ORGANIZATION				

Course Objectives:

The course objectives of Computer Organization are to discuss and make student familiar with the

- Principles and the Implementation of Computer Arithmetic
- Operation of CPUs including RTL, ALU, Instruction Cycle and Busses
- Fundamentals of different Instruction Set Architectures and their relationship to the CPU Design
- Memory System and I/O Organization
- Principles of Operation of Multiprocessor Systems and Pipelining

Course Outcomes:

By the end of the course, the student will

- Develop a detailed understanding of computer systems
- Cite different number systems, binary addition and subtraction, standard, floating-point, and micro operations
- Develop a detailed understanding of architecture and functionality of central processing unit
- Exemplify in a better way the I/O and memory organization
- Illustrate the concepts of parallel processing, pipelining and inter processor communication

UNIT I

Basic Structure of Computers: Basic Organization of Computers, Historical Perspective, Bus Structures, Data Representation: Data types, Complements, Fixed Point Representation. Floating – Point Representation. Other Binary Codes, Error Detection Codes.

Computer Arithmetic: Addition and Subtraction, Multiplication Algorithms, Division Algorithms.

UNIT II

Register Transfer Language and Microoperations: Register Transfer language. Register Transfer Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit.

Basic Computer Organization and Design: Instruction Codes, Computer Register, Computer Instructions, Instruction Cycle, Memory – Reference Instructions. Input –Output and Interrupt, Complete Computer Description,

UNIT III

Central Processing Unit: General Register Organization, STACK Organization. Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer.

Microprogrammed Control: Control Memory, Address Sequencing, Micro Program example, Design of Control Unit

UNIT IV

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.



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Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupts, Direct Memory Access.

UNIT-V

Multi Processors: Introduction, Characteristics of Multiprocessors, Interconnection Structures, Inter Processor Arbitration.

Pipeline: Parallel Processing, Pipelining, Instruction Pipeline, RISC Pipeline, Array Processor.

Text Books:

- 1) Computer System Architecture, M. Morris Mano, Third Edition, Pearson, 2008.
- 2) Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, 5/e, McGraw Hill, 2002.

Reference Books:

- 1) Computer Organization and Architecture, William Stallings, 6/e, Pearson, 2006.
- 2) Structured Computer Organization, Andrew S. Tanenbaum, 4/e, Pearson, 2005.
- 3) Fundamentals of Computer Organization and Design, Sivarama P. Dandamudi, Springer, 2006

e- Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105163/>
- 2) <http://www.cuc.ucc.ie/CS1101/David%20Tarnoff.pdf>



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DEPARTMENT OF INFORMATION TECHNOLOGY

II Year – I Semester		L	T	P	C
		3	0	0	3
OBJECT ORIENTED PROGRAMMING THROUGH C++					

Course Objectives:

- Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects
- Understand dynamic memory management techniques using pointers, constructors, destructors, etc
- Describe the concept of function overloading, operator overloading, virtual functions and polymorphism
- Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming
- Demonstrate the use of various OOPs concepts with the help of programs

Course Outcomes:

By the end of the course, the student will be able to

- Classify object oriented programming and procedural programming
- Apply C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling
- Build C++ classes using appropriate encapsulation and design principles
- Apply object oriented or non-object oriented techniques to solve bigger computing problems

UNIT I

Introduction to C++: Difference between C and C++, Evolution of C++, The Object Oriented Technology, Disadvantage of Conventional Programming-, Key Concepts of Object Oriented Programming, Advantage of OOP, Object Oriented Language.

UNIT II

Classes and Objects & Constructors and Destructor: Classes in C++-Declaring Objects, Access Specifiers and their Scope, Defining Member Function-Overloading Member Function, Nested class, Constructors and Destructors, Introduction, Constructors and Destructor- Characteristics of Constructor and Destructor, Application with Constructor, Constructor with Arguments (parameterized Constructor, Destructors- Anonymous Objects.

UNIT III

Operator Overloading and Type Conversion & Inheritance: The Keyword Operator, Overloading Unary Operator, Operator Return Type, Overloading Assignment Operator (=), Rules for Overloading Operators, Inheritance, Reusability, Types of Inheritance, Virtual Base Classes, Object as a Class Member, Abstract Classes, Advantages of Inheritance-Disadvantages of Inheritance.



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UNIT IV

Pointers & Binding Polymorphisms and Virtual Functions: Pointer, Features of Pointers, Pointer Declaration, Pointer to Class, Pointer Object, The this Pointer, Pointer to Derived Classes and Base Class, Binding Polymorphisms and Virtual Functions, Binding in C++, Virtual Functions, Rules for Virtual Function, Virtual Destructor.

UNIT V

Generic Programming with Templates, Need for Templates, Definition of class Templates, Normal Function Templates, Overloading of Template Function, Bubble Sort Using Function Templates, Difference Between Templates and Macros, Linked Lists with Templates, Exception Handling, Principles of Exception Handling, The Keywords try throw and catch, Multiple Catch Statements – Specifying Exceptions.

Text Books:

- 1) A First Book of C++, Gary Bronson, Cengage Learning.
- 2) The Complete Reference C++, Herbert Schildt, TMH.

Reference Books:

- 1) Object Oriented Programming C++, Joyce Farrell, Cengage.
- 2) C++ Programming: from problem analysis to program design, DS Malik, Cengage Learning.
- 3) Programming in C++, Ashok N Kamthane, Pearson 2nd Edition.

e- Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105151/>
- 2) <https://github.com/topics/object-oriented-programming>



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DEPARTMENT OF INFORMATION TECHNOLOGY

II Year – I Semester		L	T	P	C
		0	0	3	1.5
PYTHON PROGRAMMING LAB					

Course Objectives:

The aim of Python Programming Lab is

- To acquire programming skills in core Python.
- To acquire Object Oriented Skills in Python
- To develop the skill of designing Graphical user Interfaces in Python
- To develop the ability to write database applications in Python

Course Outcomes:

By the end of this lab, the student is able to

- Write, Test and Debug Python Programs
- Use Conditionals and Loops for Python Programs
- Use functions and represent Compound data using Lists, Tuples and Dictionaries
- Use various applications using python

Exercise 1 - Basics

- a) Running instructions in Interactive interpreter and a Python Script
- b) Write a program to purposefully raise Indentation Error and Correct it

Exercise 2 - Operations

- a) Write a program to compute distance between two points taking input from the user (Pythagorean Theorem)
- b) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

Exercise - 3 Control Flow

- a) Write a Program for checking whether the given number is a even number or not.
- b) Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . , 1/10
- c) Write a program using a for loop that loops over a sequence. What is sequence ?
- d) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.

Exercise 4 - Control Flow - Continued

- a) Find the sum of all the primes below two million.
- b) Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be:
- c) 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...
- d) By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

Exercise - 5 - DS

- a) Write a program to count the numbers of characters in the string and store them in a dictionary data structure
- b) Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.



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Exercise - 6 DS - Continued

- Write a program combine_lists that combines these lists into a dictionary.
- Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?

Exercise - 7 Files

- Write a program to print each line of a file in reverse order.
- Write a program to compute the number of characters, words and lines in a file.

Exercise - 8 Functions

- Write a function ball_collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.
Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius
If (distance between two balls centers) \leq (sum of their radii) then (they are colliding)
- Find mean, median, mode for the given set of numbers in a list.

Exercise - 9 Functions - Continued

- Write a function nearly_equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.
- Write a function dups to find all duplicates in the list.
- Write a function unique to find all the unique elements of a list.

Exercise - 10 - Functions - Problem Solving

- Write a function cumulative_product to compute cumulative product of a list of numbers.
- Write a function reverse to reverse a list. Without using the reverse function.
- Write function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.

Exercise 11 - Multi-D Lists

- Write a program that defines a matrix and prints
- Write a program to perform addition of two square matrices
- Write a program to perform multiplication of two square matrices

Exercise - 12 - Modules

- Install packages requests, flask and explore them. using (pip)
- Write a script that imports requests and fetch content from the page. Eg. (Wiki)
- Write a simple script that serves a simple HTTP Response and a simple HTML Page

Exercise - 13 OOP

- Class variables and instance variable and illustration of the self variable
 - Robot
 - ATM Machine

Exercise - 14 GUI, Graphics

- Write a GUI for an Expression Calculator using tk
- Write a program to implement the following figures using turtle



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Exercise - 15 - Testing

- a) Write a test-case to check the function `even_numbers` which return True on passing a list of all even numbers
- b) Write a test-case to check the function `reverse_string` which returns the reversed string

Exercise - 16 - Advanced

- a) Build any one classical data structure.
- b) Write a program to solve knapsack problem.



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II Year – I Semester		L	T	P	C
		0	0	3	1.5
DATA STRUCTURES THROUGH C++ LAB					

Course Objectives:

The objective of this lab is to

- Demonstrate procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects.
- Understand dynamic memory management techniques using pointers, constructors, destructors, etc
- Demonstrate the concept of function overloading, operator overloading, virtual functions and polymorphism, inheritance.
- Demonstrate the different data structures implementation.

Course Outcomes:

By the end of this lab the student is able to

- Apply the various OOPs concepts with the help of programs.
- Implement basic data structures such as arrays and linked list.
- Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths.
- Use various searching and sorting algorithms.

Exercise -1 (Classes Objects)

Create a Distance class with:

- feet and inches as data members
- member function to input distance
- member function to output distance
- member function to add two distance objects

- a) Write a main function to create objects of DISTANCE class. Input two distances and output the sum.
- b) Write a C++ Program to illustrate the use of Constructors and Destructors (use the above program.)
- c) Write a program for illustrating function overloading in adding the distance between objects (use the above problem)

Exercise -2 (Access)

Write a program for illustrating Access Specifiers public, private, protected

- a) Write a program implementing Friend Function
- b) Write a program to illustrate this pointer
- c) Write a Program to illustrate pointer to a class

Exercise -3 (Operator Overloading)

- a) Write a program to Overload Unary, and Binary Operators as Member Function, and Non Member Function.
 - i) Unary operator as member function
 - ii) Binary operator as non member function
- b) Write a C ++ program to implement the overloading assignment = operator

Exercise -4 (Inheritance)

- a) Write C++ Programs and incorporating various forms of Inheritance
 - i) Single Inheritance



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- ii) Hierarchical Inheritance
- iii) Multiple Inheritances
- iv) Multi-level inheritance
- v) Hybrid inheritance

b) Also illustrate the order of execution of constructors and destructors in inheritance

Exercise -5(Templates, Exception Handling)

- a) Write a C++ Program to illustrate template class
- b) Write a Program to illustrate member function templates
- c) Write a Program for Exception Handling Divide by zero
- d) Write a Program to rethrow an Exception

Exercise -6 (Searching)

- a) Write C++ program that use both recursive and non recursive functions to perform Linear search for a Key value in a given list.
- b) Write C++ program that use both recursive and non recursive functions to perform Binary search for a Key value in a given list.

Exercise -7 (Sorting-I)

- a) Write C++ program that implement Bubble sort, to sort a given list of integers in ascending order
- b) Write C++ program that implement Quick sort, to sort a given list of integers in ascending order
- c) Write C++ program that implement Insertion sort, to sort a given list of integers in ascending order

Exercise -8(Sorting-II)

- a) Write C++ program that implement radix sort, to sort a given list of integers in ascending order
- b) Write C program that implement merge sort, to sort a given list of integers in ascending order

Exercise -9 (Singly Linked List)

- a) Write a C++ program that uses functions to create a singly linked list
- b) Write a C++ program that uses functions to perform insertion operation on a singly linked list
- c) Write a C++ program that uses functions to perform deletion operation on a singly linked list
- d) Write a C++ program to reverse elements of a singly linked list.

Exercise -10(Queue)

- a) Write C++ program that implement Queue (its operations) using arrays.
- b) Write C++ program that implement Queue (its operations) using linked lists

Exercise -11(Stack)

- a) Write C++ program that implement stack (its operations) using arrays
- b) Write C++ program that implement stack (its operations) using Linked list
- c) Write a C++ program that uses Stack operations to evaluate postfix expression

Exercise -12(Binary Search Tree)

- a) Write a C++ program to Create a BST
- b) Write a C++ program to insert a node into a BST.
- c) Write a C++ program to delete a node from a BST.
- d) Write a recursive C++ program for traversing a binary tree in preorder, inorder and postorder.



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DEPARTMENT OF INFORMATION TECHNOLOGY

II Year – I Semester		L	T	P	C
		3	0	0	0
ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE					

Course Objectives:

To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.

- The course aim of the importing basic principle of third process reasoning and inference sustainability is at the course of Indian traditional knowledge system
- To understand the legal framework and traditional knowledge and biological diversity act 2002 and geographical indication act 2003
- The courses focus on traditional knowledge and intellectual property mechanism of traditional knowledge and protection
- To know the student traditional knowledge in different sector

Course Outcomes:

After completion of the course, students will be able to:

- Understand the concept of Traditional knowledge and its importance
- Know the need and importance of protecting traditional knowledge
- Know the various enactments related to the protection of traditional knowledge
- Understand the concepts of Intellectual property to protect the traditional knowledge

UNIT I

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge

Learning Outcomes:

At the end of the unit, the student will able to:

- Understand the traditional knowledge.
- Contrast and compare characteristics importance kinds of traditional knowledge.
- Analyze physical and social contexts of traditional knowledge.
- Evaluate social change on traditional knowledge.

UNIT II

Protection of traditional knowledge: the need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

Learning Outcomes:

At the end of the unit, the student will able to:

- Know the need of protecting traditional knowledge.
- Apply significance of tk protection.
- Analyze the value of tk in global economy.
- Evaluate role of government

UNIT III



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Legal framework and TK: A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmers Rights Act, 2001 (PPVFR Act); B: The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indications act 2003.

Learning Outcomes:

At the end of the unit the student will able to:

- Understand legal framework of TK.
- Contrast and compare the ST and other traditional forest dwellers
- Analyze plant variant protections
- Evaluate farmers right act

UNIT IV

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

Learning Outcomes:

At the end of the unit, the student will able to:

- Understand TK and IPR
- Apply systems of TK protection.
- Analyze legal concepts for the protection of TK.
- Evaluate strategies to increase the protection of TK.

UNIT V

Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

Learning Outcomes:

At the end of the unit, the student will able to:

- Know TK in different sectors.
- Apply TK in engineering.
- Analyze TK in various sectors.
- Evaluate food security and protection of TK in the country.

Reference Books:

- 1) Traditional Knowledge System in India, by Amit Jha, 2009.
- 2) Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, PratibhaPrakashan 2012.
- 3) Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002
- 4) "Knowledge Traditions and Practices of India" Kapil Kapoor, Michel Danino

e-Resources:

- 1) <https://www.youtube.com/watch?v=LZP1StpYEPM>
- 2) <http://nptel.ac.in/courses/121106003/>

II Year – I Semester		L	T	P	C
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		2	0	0	0
EMPLOYABILITY SKILLS -I					

Course Objectives:

The aim of this course is

- To explore and practice basic communication skills
- To learn skills for effective discussions & team work
- To assess and improve personal grooming

Course Outcomes:

By the end of this course, the student

- Establish effective communication with employers, supervisors, and co-workers
- Identify to explore their values and career choices through individual skill assessments
- Adapts positive attitude and appropriate body language
- Interpret the core competencies to succeed in professional and personal life

A list of vital employability skills from the standpoint of engineering students with discussion how to potentially develop such skills through campus life.

- 1) Soft Skills: An Introduction – Definition and Significance of Soft Skills; Process, Importance and Measurement of Soft Skill Development.
- 2) Self-Discovery: Discovering the Self; Setting Goals; Beliefs, Values, Attitude, Virtue.
- 3) Positivity and Motivation: Developing Positive Thinking and Attitude; Driving out Negativity; Meaning and Theories of Motivation; Enhancing Motivation Levels.
- 4) Interpersonal Communication: Interpersonal relations; communication models, process and barriers; team communication; developing interpersonal relationships through effective communication; listening skills; essential formal writing skills; corporate communication styles – assertion, persuasion, negotiation.
- 5) Public Speaking: Skills, Methods, Strategies and Essential tips for effective public speaking.
- 6) Group Discussion: Importance, Planning, Elements, Skills assessed; Effectively disagreeing, Initiating, Summarizing and Attaining the Objective.
- 7) Non-Verbal Communication: Importance and Elements; Body Language.
- 8) Teamwork and Leadership Skills: Concept of Teams; Building effective teams; Concept of Leadership and honing Leadership skills.

Reference Books:

- 1) Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
- 2) S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.
- 3) R.S. Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.
- 4) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.
- 5) Managing Soft Skills for Personality Development – edited by B.N.Ghosh, McGraw Hill India, 2012.
- 6) English and Soft Skills – S.P.Dhanavel, Orient Blackswan India, 2010.



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II Year – II Semester	L	T	P	C
	3	0	0	3
PROBABILITY AND STATISTICS				

Course Objectives:

- To familiarize the students with the foundations of probability and statistical methods
- To impart probability concepts and statistical methods in various applications Engineering

Course Outcomes:

Upon successful completion of this course, the student should be able to

- classify the concepts of data science and its importance (L4) or (L2)
- interpret the association of characteristics and through correlation and regression tools (L4)
- make use of the concepts of probability and their applications (L3)
- apply discrete and continuous probability distributions (L3)
- design the components of a classical hypothesis test (L6)
- infer the statistical inferential methods based on small and large sampling tests (L4)

UNIT I

Descriptive statistics and methods for data science: Data science – Statistics Introduction – Population vs Sample – Collection of data – primary and secondary data – Type of variable: dependent and independent Categorical and Continuous variables – Data visualization – Measures of Central tendency – Measures of Variability (spread or variance) – Skewness Kurtosis.

UNIT II

Correlation and Curve fitting: Correlation – correlation coefficient – rank correlation – regression coefficients and properties – regression lines – Method of least squares – Straight line – parabola – Exponential – Power curves.

UNIT III

Probability and Distributions: Probability – Conditional probability and Baye’s theorem – Random variables – Discrete and Continuous random variables – Distribution function – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.

UNIT IV

Sampling Theory: Introduction – Population and samples – Sampling distribution of Means and Variance (definition only) – Central limit theorem (without proof) – Introduction to t, χ^2 and F-distributions – Point and Interval estimations – Maximum error of estimate.



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UNIT V

Tests of Hypothesis: Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Tests concerning one mean and two means (Large and Small samples) – Tests on proportions.

Text Books:

- 1) Miller and Freund's, Probability and Statistics for Engineers, 7/e, Pearson, 2008.
- 2) S. C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

Reference Books:

- 1) Shron L. Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineers and the Scientists, 8th Edition, Pearson 2007.
- 2) Jay I. Devore, Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
- 3) Sheldon M. Ross, Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011.
- 4) Johannes Ledolter and Robert V. Hogg, Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson, 2010.



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II Year – II Semester		L	T	P	C
		2	1	0	3
JAVA PROGRAMMING					

Course Objectives:

- Implementing programs for user interface and application development using core java principles
- Focus on object oriented concepts and java program structure and its installation
- Comprehension of java programming constructs, control structures in Java Programming Constructs
- Implementing Object oriented constructs such as various class hierarchies, interfaces and exception handling
- Understanding of Thread concepts and I/O in Java

Course Outcomes:

- Discuss and understand java programming constructs, Control structures
- Illustrate and experiment Object Oriented Concepts like classes, objects
- Apply Object Oriented Constructs such as Inheritance, interfaces, and exception handling
- Construct applications using multithreading and I/O
- Develop Dynamic User Interfaces using applets and Event Handling in java
- Develop Code Snippets using Abstract Window Toolkit and Swings

UNIT I

Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.

Data Types, Variables, and Operators :Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

Control Statements: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

UNIT II

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods,



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Overriding Methods, Attributes Final and Static.

UNIT III

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.

Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

UNIT IV

Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions, try-with-resources, Catching Subclass Exception, Custom Exceptions, Nested try and catch Blocks, Rethrowing Exception, Throws Clause.

UNIT V

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Methods for Comparison of Strings, Methods for Modifying Strings, Methods for Searching Strings, Data Conversion and Miscellaneous Methods, Class String Buffer, Class String Builder.

Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread- Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.

Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, ResultSet Interface, Creating JDBC Application, JDBC Batch Processing, JDBC Transaction Management

Text Books:

- 1) JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
- 2) The complete Reference Java, 8th edition, Herbert Schildt, TMH.

Reference Books:



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- 1) Introduction to java programming, 7th edition by Y Daniel Liang, Pearson
- 2) Murach's Java Programming, Joel Murach

e-Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105191/>
- 2) https://www.w3schools.com/java/java_data_types.asp

II Year – II Semester		L	T	P	C
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		3	0	0	3
OPERATING SYSTEMS					

Course Objectives:

The objectives of this course is to

- Introduce to the internal operation of modern operating systems
- Define, explain, processes and threads, mutual exclusion, CPU scheduling, deadlock, memory management, and file systems
- Understand File Systems in Operating System like UNIX/Linux and Windows
- Understand Input Output Management and use of Device Driver and Secondary Storage (Disk) Mechanism
- Analyze Security and Protection Mechanism in Operating System

Course Outcomes:

After learning the course the students should be able to:

- Describe various generations of Operating System and functions of Operating System
- Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare their performance
- Solve Inter Process Communication problems using Mathematical Equations by various methods
- Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement Techniques
- Outline File Systems in Operating System like UNIX/Linux and Windows

UNIT I

Operating Systems Overview: Operating system Concepts, Operating system functions, Evaluation of Operating systems operations. System Structures: Operating System Services, operating system structure, Systems calls- Types of System Calls, operating system debugging, System generation. Process Concept: Basic concepts, Process states, process control block, Operations on processes, Inter-process Communication.

UNIT II

Process Scheduling: Scheduling Criteria, Scheduling Algorithms, Multiple Processor Scheduling, Thread Scheduling, Examples. Multithreaded Programming: Multithreading Models, Thread Libraries, Threading Issues, Examples. Process Concurrency And Synchronization: Introduction, Race Condition, Critical Region, Mutual Exclusion, Peterson's Solution, Hardware Support, Operating System Support, Semaphores, Monitors, Classic Synchronization problem: Reader's-Writer's with unlimited & limited buffer, Producer –Consumer problem, Dining philosopher's problem.



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UNIT III

Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation, Examples. Virtual Memory Management: Introduction, Demand paging, Copy on-write, Page replacement, Page replacement algorithms, Frame allocation, Thrashing. Memory-mapped files, Kernel memory allocation.

UNIT IV

Deadlocks: Resources, Conditions for resource deadlocks, Graph models of deadlocks, Deadlock detection and recovery, Deadlock avoidance, Deadlock prevention.

File Systems: Files, Directories, File system implementation, management and optimization.

Secondary-Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure.

UNIT V

System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights.

System Security: Introduction, Program threats, System and network threats, Cryptography for security, User authentication, Implementing security defenses, Firewalling to protect systems and networks, Computer security classification.

Case Studies: Study of Operating System Functionalities in various operating Systems like Windows, Unix, Linux and Mobile Operating Systems.

Text Books:

- 1) Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2013.
- 2) Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009.

Reference Books:

- 1) Dhamdhare D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw-Hill, 2012.
- 2) Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (for Inter process Communication and File systems.)
- 3) Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004.

e-Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105214/>



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II Year – II Semester		L	T	P	C
		3	0	0	3
DATABASE MANAGEMENT SYSTEMS					

Course Objectives:

- To introduce about database management systems.
- To give a good formal foundation on the relational model of data and usage of Relational Algebra
- To introduce the concepts of basic SQL as a universal Database language
- To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- To provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

Course Outcomes:

By the end of the course, the student will be able to

- Describe a relational database and object-oriented database
- Create, maintain and manipulate a relational database using SQL
- Describe ER model and normalization for database design
- Examine issues in data storage and query processing and can formulate appropriate solutions
- Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage

UNIT I

Introduction: Database system, Characteristics (Database Vs File System), Database Users(Actors on Scene, Workers behind the scene), Advantages of Data base systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

UNIT II

Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).

UNIT III

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams. SQL: Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.

UNIT IV

Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF), Fifth Normal Form (5NF).



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UNIT V

Transaction Concept: Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.

Indexing Techniques: B+ Trees: Search, Insert, Delete algorithms, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes , Index data Structures, Hash Based Indexing: Tree base Indexing, Comparison of File Organizations, Indexes and Performance Tuning.

Text Books:

- 1) Data base Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH.
- 2) Data base System Concepts, 5/e, Silberschatz, Korth, TMH.

Reference Books:

- 1) Introduction to Database Systems, 8/e C J Date, PEA.
- 2) Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA.
- 3) Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

e-Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105175/>
- 2) <https://www.geeksforgeeks.org/introduction-to-nosql/>



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DEPARTMENT OF INFORMATION TECHNOLOGY

II Year – II Semester		L	T	P	C
		3	0	0	3
THEORY OF COMPUTATION					

Course Objectives:

- To learn fundamentals of Regular and Context Free Grammars and Languages
- To understand the relation between Regular Language and Finite Automata and machines
- To learn how to design Automata’s and machines as Acceptors, Verifiers and Translators
- To understand the relation between Contexts free Languages, PDA and TM
- To learn how to design PDA as acceptor and TM as Calculators

Course Outcomes:

By the end of the course students can

- Classify machines by their power to recognize languages
- Attain the knowledge of language classes & grammars relationship among them with the help of Chomsky hierarchy
- Employ finite state machines to solve problems in computing
- Illustrate deterministic and non-deterministic machines
- Comprehend the hierarchy of problems arising in the computer science

UNIT I

Finite Automata: Need of Automata theory, Central Concepts of Automata Theory, Automation, Finite Automata, Transition Systems, Acceptance of a String, DFA, Design of DFAs, NFA, Design of NFA, Equivalence of DFA and NFA, Conversion of NFA into DFA, Finite Automata with ϵ -Transitions, Minimization of Finite Automata, Finite Automata with output-Mealy and Moore Machines, Applications and Limitation of Finite Automata.

UNIT II

Regular Expressions, Regular Sets, Identity Rules, Equivalence of two RE, Manipulations of REs, Finite Automata and Regular Expressions, Inter Conversion, Equivalence between FA and RE, Pumping Lemma of Regular Sets, Closure Properties of Regular Sets, Grammars, Classification of Grammars, Chomsky Hierarchy Theorem, Right and Left Linear Regular Grammars, Equivalence between RG and FA, Inter Conversion.

UNIT III

Formal Languages, Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars-Elimination of Useless Symbols, ϵ -Productions and Unit Productions, Normal Forms-Chomsky Normal Form and Greibach Normal Form, Pumping Lemma, Closure Properties, Applications of Context Free Grammars.

UNIT IV

Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description, Language Acceptance of Pushdown Automata, Design of Pushdown Automata, Deterministic and Non – Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context Free Grammars,



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Conversion, Two Stack Pushdown Automata, Application of Pushdown Automata.

UNIT V

Turning Machine: Definition, Model, Representation of TMs-Instantaneous Descriptions, Transition Tables and Transition Diagrams, Language of a TM, Design of TMs, Types of TMs, Church's Thesis, Universal and Restricted TM, Decidable and Un-decidable Problems, Halting Problem of TMs, Post's Correspondence Problem, Modified PCP, Classes of P and NP, NP-Hard and NP-Complete Problems.

Text Books:

- 1) Introduction to Automata Theory, Languages and Computation, J. E. Hopcroft, R. Motwani and J. D. Ullman, 3rd Edition, Pearson, 2008.
- 2) Theory of Computer Science-Automata, Languages and Computation, K. L. P. Mishra and N. Chandrasekharan, 3rd Edition, PHI, 2007.

Reference Books:

- 1) Elements of Theory of Computation, Lewis H.P. & Papadimition C.H., Pearson /PHI.
- 2) Theory of Computation, V. Kulkarni, Oxford University Press, 2013.
- 3) Theory of Automata, Languages and Computation, Rajendra Kumar, McGraw Hill, 2014.

e-Resources:

- 1) <https://nptel.ac.in/courses/106/104/106104028/>



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II Year – II Semester		L	T	P	C
		0	0	3	1.5
JAVA PROGRAMMING LAB					

Course Objectives:

The aim of this lab is to

- Practice programming in the Java
- Gain knowledge of object-oriented paradigm in the Java programming language
- Learn use of Java in a variety of technologies and on different platforms

Course Outcomes:

By the end of the course student will be able to write java program for

- Evaluate default value of all primitive data type, Operations, Expressions, Control-flow, Strings
- Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
- Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism
- Construct Threads, Event Handling, implement packages, developing applets

Exercise - 1 (Basics)

- a) Write a JAVA program to display default value of all primitive data type of JAVA
- b) Write a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.
- c) Five Bikers Compete in a race such that they drive at a constant speed which may or may not be the same as the other. To qualify the race, the speed of a racer must be more than the average speed of all 5 racers. Take as input the speed of each racer and print back the speed of qualifying racers.

Exercise - 2 (Operations, Expressions, Control-flow, Strings)

- a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism.
- b) Write a JAVA program to sort for an element in a given list of elements using bubble sort
- c) Write a JAVA program to sort for an element in a given list of elements using merge sort.
- d) Write a JAVA program using StringBuffer to delete, remove character.

Exercise - 3 (Class, Objects)

- a) Write a JAVA program to implement class mechanism. – Create a class, methods and invoke them inside main method.
- b) Write a JAVA program to implement constructor.

Exercise - 4 (Methods)

- a) Write a JAVA program to implement constructor overloading.
- b) Write a JAVA program implement method overloading.

Exercise - 5 (Inheritance)

- a) Write a JAVA program to implement Single Inheritance
- b) Write a JAVA program to implement multi level Inheritance
- c) Write a java program for abstract class to find areas of different shapes

Exercise - 6 (Inheritance - Continued)

- a) Write a JAVA program give example for “super” keyword.



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- b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?

Exercise - 7 (Exception)

- a) Write a JAVA program that describes exception handling mechanism

- b) Write a JAVA program Illustrating Multiple catch clauses

Exercise – 8 (Runtime Polymorphism)

- a) Write a JAVA program that implements Runtime polymorphism

- b) Write a Case study on run time polymorphism, inheritance that implements in above problem

Exercise – 9 (User defined Exception)

- a) Write a JAVA program for creation of Illustrating throw

- b) Write a JAVA program for creation of Illustrating finally

- c) Write a JAVA program for creation of Java Built-in Exceptions

- d) Write a JAVA program for creation of User Defined Exception

Exercise – 10 (Threads)

- a) Write a JAVA program that creates threads by extending Thread class .First thread display “Good Morning “every 1 sec, the second thread displays “Hello “every 2 seconds and the third display “Welcome” every 3 seconds ,(Repeat the same by implementing Runnable)

- b) Write a program illustrating **isAlive** and **join ()**

- c) Write a Program illustrating Daemon Threads.

Exercise - 11 (Threads continuity)

- a) Write a JAVA program Producer Consumer Problem

- b) Write a case study on thread Synchronization after solving the above producer consumer problem

Exercise – 12 (Packages)

- a) Write a JAVA program illustrate class path

- b) Write a case study on including in class path in your os environment of your package.

- c) Write a JAVA program that import and use the defined your package in the previous Problem

Exercise - 13 (Applet)

- a) Write a JAVA program to paint like paint brush in applet.

- b) Write a JAVA program to display analog clock using Applet.

- c) Write a JAVA program to create different shapes and fill colors using Applet.

Exercise - 14 (Event Handling)

- a) Write a JAVA program that display the x and y position of the cursor movement using Mouse.

- b) Write a JAVA program that identifies key-up key-down event user entering text in a Applet.



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II Year – II Semester		L	T	P	C
		0	0	2	1
UNIX OPERATING SYSTEM LAB					

Course Objectives:

- To understand the design aspects of operating system
- To study the process management concepts & Techniques
- To study the storage management concepts
- To familiarize students with the Linux environment
- To learn the fundamentals of shell scripting/programming

Course Outcomes:

- To use Unix utilities and perform basic shell control of the utilities
 - To use the Unix file system and file access control
 - To use of an operating system to develop software
 - Students will be able to use Linux environment efficiently
 - Solve problems using bash for shell scripting
- 1) a) Study of Unix/Linux general purpose utility command list: man,who,cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown.
 b) Study of vi editor
 c) Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system
 d) Study of Unix/Linux file system (tree structure)
 e) Study of .bashrc, /etc/bashrc and Environment variables.
 - 2) Write a C program that makes a copy of a file using standard I/O, and system calls
 - 3) Write a C program to emulate the UNIX ls -l command.
 - 4) Write a C program that illustrates how to execute two commands concurrently with a command pipe. Ex: - ls -l | sort
 - 5) Simulate the following CPU scheduling algorithms:
 (a) Round Robin (b) SJF (c) FCFS (d) Priority
 - 6) Multiprogramming-Memory management-Implementation of fork (), wait (), exec() and exit (), System calls
 - 7) Simulate the following:
 a) Multiprogramming with a fixed number of tasks (MFT)
 b) Multiprogramming with a variable number of tasks (MVT)
 - 8) Simulate Bankers Algorithm for Dead Lock Avoidance
 - 9) Simulate Bankers Algorithm for Dead Lock Prevention.
 - 10) Simulate the following page replacement algorithms:
 a) FIFO b) LRU c) LFU
 - 11) Simulate the following File allocation strategies
 (a) Sequenced (b) Indexed (c) Linked
 - 12) Write a C program that illustrates two processes communicating using shared memory
 - 13) Write a C program to simulate producer and consumer problem using semaphores



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- 14) Write C program to create a thread using *pthread* library and let it run its function.
- 15) Write a C program to illustrate concurrent execution of threads using *pthread* library.



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II Year – II Semester		L	T	P	C
		0	0	3	1.5
DATABASE MANAGEMENT SYSTEMS LAB					

Course Objectives:

This Course will enable students to

- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers

Course Outcomes:

At the end of the course the student will be able to:

- Utilize SQL to execute queries for creating database and performing data manipulation operations
- Examine integrity constraints to build efficient databases
- Apply Queries using Advanced Concepts of SQL
- Build PL/SQL programs including stored procedures, functions, cursors and triggers

List of Exercises:

1. Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)
5. a) Creation of simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
 b) Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.
8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.



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9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
12. Create a table and perform the search operation on table using indexing and non-indexing techniques.

Text Books/Suggested Reading:

- 1) Oracle: The Complete Reference by Oracle Press
- 2) Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
- 3) Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007.



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II Year – II Semester		L	T	P	C
		3	0	0	0
PROFESSIONAL ETHICS & HUMAN VALUES					

Course Objectives:

- To create an awareness on Engineering Ethics and Human Values
- To instill Moral and Social Values and Loyalty
- To appreciate the rights of others
- To create awareness on assessment of safety and risk

Course Outcomes:

Students will be able to:

- Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field
- Identify the multiple ethical interests at stake in a real-world situation or practice
- Articulate what makes a particular course of action ethically defensible
- Assess their own ethical values and the social context of problems
- Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects
- Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work
- Integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research

UNIT I

Human Values:

Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others – Living Peacefully –Caring –Sharing –Honesty –Courage-Cooperation–Commitment – Empathy –Self Confidence Character –Spirituality.

Learning outcomes:

1. Learn about morals, values & work ethics.
2. Learn to respect others and develop civic virtue.
3. Develop commitment
4. Learn how to live peacefully

UNIT II

Engineering Ethics:

Senses of 'Engineering Ethics-Variety of moral issued –Types of inquiry –Moral dilemmas –Moral autonomy –Kohlberg's theory-Gilligan's theory-Consensus and controversy –Models of professional roles-Theories about right action-Self-interest -Customs and religion –Uses of Ethical theories –Valuing time –Cooperation –Commitment.

Learning outcomes:

1. Learn about the ethical responsibilities of the engineers.
2. Create awareness about the customs and religions.
3. Learn time management
4. Learn about the different professional roles.



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UNIT III

Engineering as Social Experimentation:

Engineering As Social Experimentation –Framing the problem –Determining the facts –Codes of Ethics –Clarifying Concepts –Application issues –Common Ground -General Principles –Utilitarian thinking respect for persons.

Learning outcomes:

1. Demonstrate knowledge to become a social experimenter.
2. Provide depth knowledge on framing of the problem and determining the facts.
3. Provide depth knowledge on codes of ethics.
4. Develop utilitarian thinking

UNIT IV

Engineers Responsibility for Safety and Risk:

Safety and risk –Assessment of safety and risk –Risk benefit analysis and reducing risk-Safety and the Engineer-Designing for the safety-Intellectual Property rights (IPR).

Learning outcomes:

1. Create awareness about safety, risk & risk benefit analysis.
2. Engineer's design practices for providing safety.
3. Provide knowledge on intellectual property rights.

UNIT V

Global Issues:

Globalization –Cross-culture issues-Environmental Ethics –Computer Ethics –Computers as the instrument of Unethical behavior –Computers as the object of Unethical acts –Autonomous Computers-Computer codes of Ethics –Weapons Development -Ethics and Research –Analyzing Ethical Problems in research.

Learning outcomes:

1. Develop knowledge about global issues.
2. Create awareness on computer and environmental ethics
3. Analyze ethical problems in research.
4. Give a picture on weapons development.

Text Books:

- 1) "Engineering Ethics includes Human Values" by M.Govindarajan, S.Natarajan and, V.S.Senthil Kumar-PHI Learning Pvt. Ltd-2009
- 2) "Engineering Ethics" by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.
- 3) "Ethics in Engineering" by Mike W. Martin and Roland Schinzinger –Tata McGraw-Hill–2003.
- 4) "Professional Ethics and Morals" by Prof.A.R.Aryasri, DharanikotaSuyodhana-Maruthi Publications.
- 5) "Professional Ethics and Human Values" by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran-LaxmiPublications.
- 6) "Professional Ethics and Human Values" by Prof.D.R.Kiran-
- 7) "Indian Culture, Values and Professional Ethics" by PSR Murthy-BS Publication.



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II Year – II Semester		L	T	P	C
		0	0	2	1
SOCIALLY RELEVANT PROJECT					

Course Objectives:

The aim of Socially Relevant Project is to encourage students

- To express their ideas, to solve real-world problems and to complete projects
- Using human experience to gather ideas from a wide range of problems in society by observation or pooling information
- Using scientific, social-scientific, humanistic, cultural reasoning to analyze global problems

Course Outcomes:

The student learns to

- Use scientific reasoning to gather, evaluate, and interpret ideas
- Analyze and design solutions to solve the ideas
- Use one or more creative tools to complete the projects

Student can choose any one of the given below / any other socially relevant problem and work on it to produce a project document.

1. Water Conservation Related Works
2. Swatch Bharath (Internal External)
3. Helping police
4. Traffic monitoring
5. Teaching Rural Kids (Sarva siksha Abhiyan)
6. Street light monitoring
7. Electricity Conservation
8. Solar panel utilization
9. E- policing & cyber solution
10. Pollution
11. Any social related



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III Year – I Semester		L	T	P	C
		3	1	0	4
ADVANCED DATA STRUCTURES					

Course Objectives:

- Describe and implement a variety of advanced data structures (hash tables, priority queues, balanced search trees, graphs)
- Analyze the space and time complexity of the algorithms studied in the course
- Identify different solutions for a given problem; analyze advantages and disadvantages to different solutions
- Demonstrate an understanding of Amortization
- Demonstrate an understanding of various search trees

Course Outcomes:

Upon completion of the course, graduates will be able to

- Illustrate several sub-quadratic sorting algorithms.
- Demonstrate recursive methods
- Apply advanced data structures such as balanced search trees, hash tables, priority queues and the disjoint set union/find data structure

UNIT I

Sorting: Medians and order statistics, External Sorting, Introduction, K-way Merging, Buffer Handling for parallel Operation, Run Generation, Optimal Merging of Runs.

Hashing: Introduction, Static Hashing, Hash Table, Hash Functions, Secure Hash Function, Overflow Handling, Theoretical Evaluation of Overflow Techniques, Dynamic Hashing- Motivation for Dynamic Hashing, Dynamic Hashing Using Directories, Directory less Dynamic Hashing, Alternate hash functions (mid-square, folding, digit analysis), Double Hashing

UNIT II

Priority Queues and Advance Heaps: Double Ended Priority queues, Leftist Trees: Height Biased, Weight Biased. Binomial Heaps: Cost Amortization, Definition of Binomial Heaps, Insertion, Melding two Binomial Heaps, deletion of min element. Fibonacci Heaps: Definition, Deletion from an F-heap, Decrease key, Cascading Cut.

UNIT III

Advanced and Efficient Binary Search Trees: Optimal Binary Search Trees, AVL Trees- rotations, insertion, deletion operations, Red-Black Trees, Definition, Representation of a Red-Black Tree, Searching a Red-Black Tree, Inserting into a Red Black Tree, Deletion from a Red-Black Tree, Joining Red-Black Trees, Splitting a Red-Black tree.

UNIT IV

Multi-way Search Trees: M-Way Search Trees, Definition and Properties, Searching an M-Way Search Tree, B-Trees, Definition and Properties, Number of Elements in a B-tree, Insertion into B-Tree, Deletion from a B-Tree, B+-Tree Definition, Searching a B+-Tree, Insertion into B+-tree, Deletion from a B+-Tree.



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UNIT V

Digital Search Structures: Digital Search Trees: Definition, Search, Insert and Delete. Binary Tries, Compressed Binary Tries. Multi-way Tries: Definition, searching a Trie, sampling strategies, Insertion, Deletion, Height of a Trie. Prefix Search and applications. Suffix Trees.

Text Books:

- 1) Fundamentals of Data Structures in C: 2nd ed, , Horowitz , Sahani, Anderson-freed, Universities Press
- 2) Data Structures, a Pseudo code Approach, Richard F Gilberg, Behrouz A Forouzan, Cengage.

Reference Books:

- 1) Data structures and Algorithm Analysis in C, 2nd edition, Mark Allen Weiss, Pearson
- 2) “Introduction to Algorithms”, T. Cormen, R.Rivest, C. Stein, C. Leiserson, PHI publication, Second Edition, 2004, ISBN 81-203-2141-3.

e-Resources:

- 1) <http://lcm.csa.iisc.ernet.in/dsa/dsa.html>
- 2) http://utubersity.com/?page_id=878
- 3) <http://freevidelectures.com/Course/2519/C-Programming-and-Data-Structures>
- 4) <http://freevidelectures.com/Course/2279/Data-Structures-And-Algorithms>



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DEPARTMENT OF INFORMATION TECHNOLOGY

III Year – I Semester		L	T	P	C
		3	0	0	3
COMPUTER NETWORKS					

Course Objectives:

The main objectives of this course are

- Study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model
- Study data link layer concepts, design issues, and protocols

Course Outcomes:

At the end of the course, the students will be able to:

- Illustrate the OSI and TCP/IP reference model
- Analyze MAC layer protocols and LAN technologies

UNIT I

Introduction: Data Communication, components, data representation, data flow; Networks: network criteria, physical structures, network models, categories of network, inter connection of networks; The Internet: brief history, internet today, Standard organization, internet standards, Protocol Layering, TCP/IP Protocol Suite, The OSI model.

UNIT II

Physical layer: Data & Signals, Transmission Impairment, Data Rate Limits, Performance, Multiplexing, Spread Spectrum, Transmission Media: Guided Media, Unguided Media, introduction to switching: Circuit Switched Networks, Packet Switching.

UNIT III

Data Link Layer: Introduction, Link layer Addressing, Error Detection and Correction: Types of Errors, Redundancy, Detection vs Correction, Coding, block coding, cyclic codes: cyclic redundancy check, polynomials, cyclic code analysis, advantages, hard ware implementation, Checksum, Forward Error Correction, DLC Services, Data Link Layer Protocols

UNIT IV

Data Link layer: HDLC: configuration and transfer modes, framing, Point to Point protocol(PPP): services, framing, transition phase, multiplexing
 Random Access: ALOHA, CSMA, CSMA/CD, CSMA/CA, Controlled Access: Reservation, Polling, Token Passing, Channelization: FDMA, TDMA, CDMA.

UNIT V

Ethernet Protocol, Standard Ethernet, Fast Ethernet, Gigabit Ethernet, 10 Gigabit Ethernet, IEEE-802.11: Architecture, MAC sub layer, addressing mechanism, Physical Layer
 Bluetooth: Architecture, bluetooth layers, WiMax, Cellur Telephony, Satellite Networks.
 Connecting Devices, Virtual LANS



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Text Books:

- 1) Data Communication and Networking , Behrouz A. Forouzan, McGraw Hill, 5th Edition, 2012
- 2) Computer Networks , Andrew S. Tanenbaum, David J. Wetherall, Pearson Education India; 5 edition, 2013

Reference Books:

- 1) Computer networks, Mayank Dave, CENGAGE.
- 2) Computer Networks: A Systems Approach, LL Peterson, BS Davie, Morgan-Kauffman , 5th Edition, 2011.
- 3) Computer Networking: A Top-Down Approach JF Kurose, KW Ross, Addison-Wesley , 5th Edition, 2009

e-Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105183/>



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III Year – I Semester		L	T	P	C
		3	0	0	3
COMPILER DESIGN					

Course Objectives:

- To study the various phases in the design of a compiler
- To understand the design of top-down and bottom-up parsers
- To understand syntax directed translation schemes
- To introduce LEX and YACC tools
- To learn to develop algorithms to generate code for a target machine

Course Outcomes:

At the end of the course, the students will be able to:

- Design, develop, and implement a compiler for any language
- Use LEX and YACC tools for developing a scanner and a parser
- Design and implement LL and LR parsers
- Design algorithms to perform code optimization in order to improve the performance of a program in terms of space and time complexity
- Apply algorithms to generate machine code

UNIT I

Introduction: Language Processors, the structure of a compiler, the science of building a compiler, programming language basics.

Lexical Analysis: The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical-Analyzer Generator Lex, Finite Automata, From Regular Expressions to Automata, Design of a Lexical-Analyzer Generator, Optimization of DFA-Based Pattern Matchers.

UNIT II

Syntax Analysis: Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Recursive and Non recursive top down parsers, Bottom-Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers, Using Ambiguous Grammars, Parser Generators.

UNIT III

Syntax-Directed Translation: Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax-Directed Translation, Syntax-Directed Translation Schemes, and Implementing L-Attributed SDD's. Intermediate-Code Generation: Variants of Syntax Trees, Three-Address Code, Types and Declarations, Type Checking, Control Flow, Back patching, Switch-Statements, Intermediate Code for Procedures.

UNIT IV

Run-Time Environments: Storage organization, Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management, Introduction to Garbage Collection, Introduction to Trace-Based Collection. Code Generation: Issues in the Design of a Code Generator, The Target Language, Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, A Simple Code Generator, Peephole Optimization, Register Allocation and Assignment, Dynamic Programming Code-Generation.



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UNIT V

Machine-Independent Optimizations: The Principal Sources of Optimization, Introduction to Data-Flow Analysis, Foundations of Data-Flow Analysis, Constant Propagation, Partial-Redundancy Elimination, Loops in Flow Graphs.

Text Books:

- 1) Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Pearson.
- 2) Compiler Construction-Principles and Practice, Kenneth C Louden, Cengage Learning.

Reference Books:

- 1) Modern compiler implementation in C, Andrew W Appel, Revised edition, Cambridge University Press.
- 2) The Theory and Practice of Compiler writing, J. P. Tremblay and P. G. Sorenson, TMH
- 3) Writing compilers and interpreters, R. Mak, 3rd edition, Wiley student edition.

e-Resources:

- 1) <https://nptel.ac.in/courses/106/104/106104123/>



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DEPARTMENT OF INFORMATION TECHNOLOGY

III Year – I Semester	L	T	P	C
	3	0	0	3
ARTIFICIAL INTELLIGENCE				

Course Objectives:

- To have a basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language
- To have an understanding of the basic issues of knowledge representation and blind and heuristic search, as well as an understanding of other topics such as minimax, resolution that play an important role in AI programs
- To have a basic understanding of some of the more advanced topics of AI

Course Outcomes:

- Outline problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem
- Apply the language/framework of different AI methods for a given problem
- Implement basic AI algorithms
- Design and carry out an empirical evaluation of different algorithms on problem formalization and state the conclusions that the evaluation supports

UNIT I

Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends.

UNIT II

Problem solving: state-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative deepening A*, constraint satisfaction

Problem reduction and game playing: Introduction, problem reduction, game playing, alpha beta pruning, two-player perfect information games.

UNIT III

Logic concepts: Introduction, propositional calculus, propositional logic, natural deduction system, axiomatic system, semantic tableau system in propositional logic, resolution refutation in propositional logic, predicate logic.

UNIT IV

Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure, CYC theory, case grammars, semantic web.

UNIT V

Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems

Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, Dempster-Shafer theory.



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Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions, multi valued logic, fuzzy logic, linguistic variables and hedges, fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems.

Text Books:

- 1) Artificial Intelligence- Saroj Kaushik, CENGAGE Learning.
- 2) Artificial intelligence, A modern Approach , 2nded, Stuart Russel, Peter Norvig, PEA.

Reference Books:

- 1) Artificial Intelligence- Deepak Khemani, TMH, 2013.
- 2) Introduction to Artificial Intelligence, Patterson, PHI.
- 3) Artificial intelligence, structures and Strategies for Complex problem solving, George F Lugar, 5th ed, PEA.

e-Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105077/>
- 2) <http://aima.cs.berkeley.edu/>



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III Year – I Semester		L	T	P	C
		3	0	0	3
SOFTWARE TESTING METHODOLOGIES					

Course Objectives:

- To study fundamental concepts in software testing and discuss various software testing issues and solutions in software unit, integration, regression and system testing
- To learn how to plan a test project, design test cases and data, conduct testing, manage software problems and defects, generate a test report
- To expose the advanced software testing concepts such as object-oriented software testing methods, web-based and component-based software testing
- To understand software test automation problems and solutions
- To learn how to write software test documents and communicate with engineers in various forms

Course Outcomes:

By the end of the course, the student should have the ability to:

- Identify and understand various software testing problems, apply software testing knowledge and engineering methods and solve these problems by designing and selecting software test models, criteria, strategies, and methods
- Design and conduct a software test process for a software project
- Analyze the needs of software test automation
- Use various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects
- Basic understanding and knowledge of contemporary issues in software testing, such as component-based, web based and object oriented software testing problems
- Write test cases for given software to test it before delivery to the customer and write test scripts for both desktop and web based applications

UNIT I

Software Testing: Introduction, Evolution, Myths & Facts, Goals, Psychology, definition, Model for testing, Effective Vs Exhaustive Software Testing.

Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle, Software Testing Methodology.

Verification and Validation: Verification & Validation Activities, Verification, Verification of Requirements, High level and low level designs, verifying code, Validation

UNIT II

Dynamic Testing-Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing, Error guessing

White-Box Testing: need, Logic Coverage criteria, Basis Path testing, Graph matrices, Loop testing, data flow testing, mutation testing



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UNIT III

Static Testing: Inspections, Structured Walkthroughs, Technical Reviews

Validation activities: Unit testing, Integration Testing, Function testing, system testing, acceptance testing

Regression testing: Progressives Vs regressive testing, Regression test ability, Objectives of regression testing, Regression testing types, Regression testing techniques

UNIT IV

Efficient Test Suite Management: growing nature of test suite, Minimizing the test suite and its benefits, test suite prioritization, Types of test case prioritization, prioritization techniques, measuring the effectiveness of a prioritized test suite

Software Quality Management: Software Quality metrics, SQA models

Debugging: process, techniques, correcting bugs.

UNIT V

Automation and Testing Tools: need for automation, categorization of testing tools, selection of testing tools, Cost incurred, Guidelines for automated testing, overview of some commercial testing tools such as Win Runner, Load Runner, Jmeter and JUnit . Test Automation using Selenium tool.

Testing Object Oriented Software: basics, Object oriented testing

Testing Web based Systems: Challenges in testing for web based software, quality aspects, web engineering, testing of web based systems, Testing mobile systems

Text Books:

- 1) Software Testing, Principles and Practices, Naresh Chauhan, Oxford.
- 2) Software Testing- Yogesh Singh, CAMBRIDGE.

Reference books:

- 1) Foundations of Software testing, Aditya P Mathur, 2ed, Pearson.
- 2) Software testing techniques – Baris Beizer, Dreamtech, second edition.
- 3) Software Testing, Principles, techniques and Tools, M G Limaye, TMH
- 4) Effective Methods for Software testing, Willian E Perry, 3ed, Wiley

e-Resources:

- 1) https://www.tutorialspoint.com/software_testing_dictionary/test_tools.htm



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III Year – I Semester	L	T	P	C
	3	0	0	3
NoSQL DATABASES				

Course Objectives:

The objective of the course is to:

- Define, compare and use the four types of NoSQL Databases (Document-oriented, Key Value Pairs, Column oriented and Graph)
- Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases
- Explain the detailed architecture, define objects, load data, query data and performance tune Document oriented NoSQL databases
- Ability to design entity relationship model and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data

Course Outcomes:

After the completion of the course, student will be able to do the following

- Identify what type of NoSQL database to implement based on business requirements (key-value, document, full text, graph, etc.)
- Apply NoSQL data modeling from application specific queries
- Use Atomic Aggregates and denormalization as data modelling techniques to optimize query processing

UNIT I

Introduction to NoSQL: Definition And Introduction, Sorted Ordered Column-Oriented Stores, Key/Value Stores, Document Databases, Graph Databases, Examining Two Simple Examples, Location Preferences Store, Car Make And Model Database, Working With Language Bindings.

UNIT II

Interacting with NoSQL: If NoSql Then What, Language Bindings For NoSQL Data Stores, Performing Crud Operations, Creating Records, Accessing Data, Updating And Deleting Data

UNIT III

NoSQL Storage Architecture: Working With Column-Oriented Databases, Hbase Distributed Storage Architecture, Document Store Internals, Understanding Key/Value Stores In Memcached And Redis, Eventually Consistent Non-Relational Databases.

UNIT IV

NoSQL Stores: Similarities Between Sql And MongoDB Query Features, Accessing Data From Column-Oriented Databases Like Hbase, Querying Redis Data Stores, Changing Document Databases, Schema Evolution In Column-Oriented Databases, Hbase Data Import And Export, Data Evolution In Key/Value Stores.

UNIT V

Indexing and Ordering Data Sets : Essential Concepts Behind A Database Index, Indexing And Ordering In MongoDB, Creating and Using Indexes In MongoDB, Indexing And Ordering In Couchdb, Indexing In Apache Cassandra.



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Text Books:

- 1) Pramod Sadalage and Martin Fowler, NoSQL Distilled, Addison-Wesley Professional, 2012.
- 2) Dan McCreary and Ann Kelly, Making Sense of NoSQL, Manning Publications, 2013.

Reference Books:

- 1) Shashank Tiwari, Professional NoSQL, Wrox Press, Wiley, 2011, ISBN: 978-0-470-94224-6
- 2) Gaurav Vaish, Getting Started with NoSQL, Packt Publishing, 2013.



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III Year – I Semester		L	T	P	C
		3	0	0	3
SCRIPTING LANGUAGES					

Course Objectives:

From the course the student will

- Understand the concepts of scripting languages for developing web based projects
- Illustrates object oriented concepts like PHP, PYTHON, PERL
- Create database connections using PHP and build the website for the world
- Demonstrate IP address for connecting the web servers
- Analyze the internet ware application, security issues and frame works for application

Course Outcomes:

After the completion of the course, student will be able to do the following

- Ability to understand the differences between scripting languages
- Create PHP authentication Methodology for security issues
- Identify PHP encryption functions and Mcrypt Package
- Explain syntax and variables in TCL
- Able to gain some fluency programming in Ruby, JavaScript, Perl, Python, and related languages
- Master an understanding of python especially the object oriented concepts

UNIT I

Introduction to PERL and Scripting: Scripts and Programs, Origin of Scripting , Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT II

Advanced PERL: Finer points of looping, pack and unpack, file system, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

PHP Basics: PHP Basics- Features, Embedding PHP Code in your Web pages, Outputting the data to the browser, Data types, Variables, Constants, expressions, string interpolation, control structures, Function, Creating a Function, Function Libraries, Arrays, strings and Regular Expressions.

UNIT III

Advanced PHP Programming: PHP and Web Forms, Files, PHP Authentication and Methodologies- Hard Coded, File Based, Database Based, IP Based, Login Administration, Uploading Files with PHP, Sending Email using PHP, PHP Encryption Functions, the Mcrypt package, Building Web sites for the World.

UNIT IV

TCL: TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures , strings , patterns, files, Advance TCL- eval, source, exec and uplevel commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts



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Internet Programming, Security Issues, C Interface. Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding , Perl-Tk.

UNIT V

Python: Introduction to Python language, python-syntax, statements, functions, Built-in-functions and Methods, Modules in python, Exception Handling. Integrated Web Applications in Python – Building Small, Efficient Python Web Systems, Web Application Framework.

Text Books:

- 1) The World of Scripting Languages, David Barron, Wiley Publications.
- 2) Python Web Programming, Steve Holden and David Beazley, New Riders Publications.
- 3) Beginning PHP and MySQL, 3rd Edition, Jason Gilmore, Apress Publications (Dream tech).

References Books:

- 1) Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP, J.Lee and B.Ware (Addison Wesley) Pearson Education. Programming Python, M.Lutz, SPD.
- 2) PHP 6 Fast and Easy Web Development, Julie Meloni and Matt Telles, Cengage Learning Publications.
- 3) Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
- 4) PHP and MySQL by Example, E.Quigley, Prentice Hall (Pearson).
- 5) Perl Power, J.P.Flynt, Cengage Learning.



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III Year – I Semester	COMPUTER GRAPHICS	L	T	P	C
		3	0	0	3

Course Objectives:

From the course the student will

- To develop, design and implement two and three dimensional graphical structures
- To enable students to acquire knowledge Multimedia compression and animations
- To learn Creation, Management and Transmission of Multimedia objects

Course Outcomes:

After learning the course, the student will be able:

- Illustrate the basics of computer graphics, different graphics systems and applications of computer graphics with various algorithms for line, circle and ellipse drawing objects for 2D transformations
- Apply projections and visible surface detection techniques for display of 3D scene on 2D screen
- Illustrate able to create the general software architecture of programs that use 3D object sets with computer graphics

UNIT I

Introduction to Graphics: Application areas of Computer Graphics, overview of graphics systems, video-display devices, graphics monitors and work stations and input devices

2D Primitives: Output primitives – Line, Circle and Ellipse drawing algorithms, Attributes of output primitives, Two dimensional Geometric transformations, Two dimensional viewing – Line, Polygon, Curve and Text clipping algorithms

UNIT II

3D Concepts: Parallel and Perspective projections, Three dimensional object representation– Polygons, Curved lines, Splines, Quadric Surfaces, Visualization of data sets, 3D transformations, Viewing, Visible surface identification.

UNIT III

Graphics Programming: Color Models – RGB, YIQ, CMY, HSV, Animations – General Computer Animation, Raster, Keyframe. Graphics programming using OpenGL – Basic graphics primitives, Drawing three dimensional objects, Drawing three dimensional scenes

UNIT IV

Rendering: Introduction to shading models, Flat and Smooth shading, Adding texture to faces, Adding shadows of objects, Building a camera in a program, Creating shaded objects



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UNIT V

Overview of Ray Tracing: Intersecting rays with other primitives, Adding Surface texture, Reflections and Transparency, Boolean operations on Objects.

Text Books:

- 1) Donald Hearn, Pauline Baker, Computer Graphics – C Version, second edition, Pearson Education, 2004.
- 2) Schaum's Outline of Computer Graphics Second Edition, Zhigang Xiang, Roy A. Plastock.

Reference Books:

- 1) James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics- Principles and practice, Second Edition in C, Pearson Education, 2007.
- 2) F.S. Hill, Computer Graphics using OPENGL, Second edition, Pearson Education, 2003.

e-Resources:

- 1) <http://math.hws.edu/eck/cs424/downloads/graphicsbook-linked.pdf>
- 2) <https://nptel.ac.in/courses/106/106/106106090/>



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III Year – I Semester		L	T	P	C
		3	0	0	3
R PROGRAMMING					

Course Objectives:

After taking the course, students will be able to

- Use R for statistical programming, computation, graphics, and modeling
- Write functions and use R in an efficient way
- Fit some basic types of statistical models
- Use R in their own research
- Be able to expand their knowledge of R on their own

Course Outcomes:

At the end of this course, students will be able to:

- Demonstration and implement of basic R programming framework and data structures
- Explain critical R programming language concepts such as control structures and recursion
- Applying mathematical and statistical operations data structures in R
- Examine data-sets to create testable hypotheses and identify appropriate statistical tests
- Make use of appropriate statistical tests using R and Create and edit visualizations with regression models
- Define model choices and results

UNIT I

Introduction, How to run R, R Sessions and Functions, Basic Math, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes.

UNIT II

R Programming Structures, Control Statements, Loops, - Looping Over Nonvector Sets,- If-Else, Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objective, No Pointers in R, Recursion, A Quicksort Implementation-Extended Example: A Binary Search Tree.

UNIT III

Doing Math and Simulation in R, Math Function, Extended Example Calculating Probability-Cumulative Sums and Products-Minima and Maxima- Calculus, Functions Fir Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices, Extended Example: Vector cross Product-Extended Example: Finding Stationary Distribution of Markov Chains, Set Operation, Input /out put, Accessing the Keyboard and Monitor, Reading and writer Files.

UNIT IV

Graphics, Creating Graphs, The Workhorse of R Base Graphics, the plot() Function –Customizing Graphs, Saving Graphs to Files.

UNIT V

Probability Distributions, Normal Distribution- Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests,-ANOVA. Linear Models, Simple Linear Regression, -Multiple Regression Generalized Linear Models, Logistic Regression, - Poisson



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Regression- other Generalized Linear Models-Survival Analysis, Nonlinear Models, Splines- Decision-
Random Forests.

Text Books:

- 1) The Art of R Programming, Norman Matloff, Cengage Learning
- 2) R for Everyone, Lander, Pearson

Reference Books:

- 1) R Cookbook, Paul Teetor, Oreilly.
- 2) R in Action, Rob Kabacoff, Manning

e- Resources:

- 1) <https://www.tutorialspoint.com/r/index.htm>



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III Year – I Semester		L	T	P	C
		3	0	0	3
DESIGN AND ANALYSIS OF ALGORITHMS					

Course Objectives:

- To provide an introduction to formalisms to understand, analyze and denote time complexities of algorithms
- To introduce the different algorithmic approaches for problem solving through numerous example problems
- To provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness

Course Outcomes:

- Describe asymptotic notation used for denoting performance of algorithms
- Analyze the performance of a given algorithm and denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms
- List and describe various algorithmic approaches
- Solve problems using divide and conquer, greedy, dynamic programming, backtracking and branch and bound algorithmic approaches
- Apply graph search algorithms to real world problems
- Demonstrate an understanding of NP- Completeness theory and lower bound theory

UNIT I

Introduction: Algorithm Definition, Algorithm Specification, performance Analysis, Randomized Algorithms.

Sets & Disjoint set union: introduction, union and find operations.

Basic Traversal & Search Techniques: Techniques for Graphs, connected components and Spanning Trees, Bi-connected components and DFS.

UNIT II

Divide and Conquer: General Method, Defective chessboard, Binary Search, finding the maximum and minimum, Merge sort, Quick sort.

The Greedy Method: The general Method, container loading, knapsack problem, Job sequencing with deadlines, minimum-cost spanning Trees.

UNIT III

Dynamic Programming: The general method, multistage graphs, All pairs-shortest paths, single-source shortest paths: general weights, optimal Binary search trees, 0/1 knapsack, reliability Design, The traveling salesperson problem.

UNIT IV

Backtracking: The General Method, The 8-Queens problem, sum of subsets, Graph coloring, Hamiltonian cycles, knapsack problem.

Branch and Bound: FIFO Branch-and-Bound, LC Branch-and-Bound, 0/1 Knapsack problem, Traveling salesperson problem.



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UNIT V

NP-Hard and NP-Complete problems: Basic concepts, Cook's Theorem.

String Matching: Introduction, String Matching-Meaning and Application, Naïve String Matching Algorithm, Rabin-Karp Algorithm, Knuth-Morris-Pratt Automata, Tries, Suffix Tree.

Text Books:

- 1) Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press.
- 2) Harsh Bhasin, "Algorithms Design & Analysis", Oxford University Press.

Reference Books:

- 1) Horowitz E. Sahani S: "Fundamentals of Computer Algorithms", 2nd Edition, Galgotia Publications, 2008.
- 2) S. Sridhar, "Design and Analysis of Algorithms", Oxford University Press.

e-Resources:

- 1) <http://nptel.ac.in/courses/106101060/>



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III Year – I Semester		L	T	P	C
		0	0	3	1.5
COMPUTER NETWORKS & COMPILER DESIGN LAB					

Course Objectives:

- To learn and use network commands
- To learn socket programming
- To implement and analyze various network protocols
- To implement various parsers

Course Outcomes:

Upon Completion of the course, the students will be able to:

- Implement various protocols using TCP and UDP
- Compare the performance of different transport layer protocols
- Use simulation tools to analyze the performance of various network protocols
- Analyze various routing algorithms
- Implement error correction codes
- Implement parsers

List of experiments

- 1) Connect the computers in Local Area Network
- 2) Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and traceroute PDUs using a network protocol analyzer and examine.
- 3) Implement Data Link Framing method - Character Count.
- 4) Implement Data link framing method - Bit stuffing and Destuffing.
- 5) Implement Error detection method - even and odd parity.
- 6) Implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.
- 7) Implement Data Link protocols - Unrestricted simplex protocol
- 8) Implement data link protocols - Stop and Wait protoc
- 9) Simulate error correction code (like CRC).
- 10) Write a C program to recognize strings under 'a', 'a*b+', 'abb'.
- 11) Write a C program to test whether a given identifier is valid or not.
- 12) Write a C program to simulate lexical analyser for validating operators
- 13) Write a C program for constructing recursive descent parsing.
- 14) Write a C program to implement LALR parsing.
- 15) Write a C program to implement operator precedence parsing.

SOFTWARE:

1. C / C++ / Java / Python / Equivalent Compiler 30
2. Network simulator like NS2/Glomosim/OPNET/ Packet Tracer / Equivalent



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III Year – I Semester		L	T	P	C
		0	0	3	1.5
AI TOOLS & TECHNIQUES LAB					

Course Objectives:

- Study the concepts of Artificial Intelligence
- Learn the methods of solving problems using Artificial Intelligence
- Introduce the concepts of machine learning

Course Outcomes:

At the end of the course, the students will be able to:

- Identify problems that are amenable to solution by AI methods
- Identify appropriate AI methods to solve a given problem
- Use language/framework of different AI methods for solving problems
- Implement basic AI algorithms
- Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports

List of Experiments:

1. Study of Prolog.
2. Write simple fact for the statements using PROLOG.
3. Write predicates One converts centigrade temperatures to Fahrenheit, the other checks if a temperature is below freezing
4. Write a program to solve the Monkey Banana problem.
5. Write a program in turbo prolog for medical diagnosis and show the advantage and disadvantage of green and red cuts
6. Write a program to implement factorial, Fibonacci of a given number
7. Write a program to solve 4-Queen and 8-puzzle problem.
8. Write a program to solve traveling salesman problem.
9. Write a program to solve water jug problem using LISP
10. Implementation of A* Algorithm using LISP /PROLOG
11. Implementation of Hill Climbing Algorithm using LISP /PROLOG
12. Implementation of DFS and BFS for water jug problem using LISP /PROLOG
13. Implementation of Towers of Hanoi Problem using LISP /PROLOG



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III Year – I Semester		L	T	P	C
		2	0	0	0
Employability Skills -II					

Course Objectives:

The main of this course is

- To learn how to make effective presentations and impressive interviews
- To learn skills for discussing and resolving problems on the work site
- To assess and improve personal grooming
- To promote safety awareness including rules and procedures on the work site
- To develop and practice self management skills for the work site

Course Outcomes:

By the end of this course, the student

- Recite the corporate etiquette.
- Make presentations effectively with appropriate body language
- Be composed with positive attitude
- Apply their core competencies to succeed in professional and personal life

A list of vital employability skills from the standpoint of engineering students with discussion how to potentially develop such skills through campus life.

- 1) Interview Skills: Interviewer and Interviewee – in-depth perspectives. Before, During and After the Interview. Tips for Success.
- 2) Presentation Skills: Types, Content, Audience Analysis, Essential Tips – Before, During and After, Overcoming Nervousness.
- 3) Etiquette and Manners – Social and Business.
- 4) Time Management – Concept, Essentials, Tips.
- 5) Personality Development – Meaning, Nature, Features, Stages, Models; Learning Skills; Adaptability Skills.
- 6) Decision-Making and Problem-Solving Skills: Meaning, Types and Models, Group and Ethical Decision-Making, Problems and Dilemmas in application of these skills.
- 7) Conflict Management: Conflict - Definition, Nature, Types and Causes; Methods of Conflict Resolution.
- 8) Stress Management: Stress - Definition, Nature, Types, Symptoms and Causes; Stress Analysis Models and Impact of Stress; Measurement and Management of Stress
- 9) Leadership and Assertiveness Skills: A Good Leader; Leaders and Managers; Leadership Theories; Types of Leaders; Leadership Behaviour; Assertiveness Skills.



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- 10) Emotional Intelligence: Meaning, History, Features, Components, Intrapersonal and Management Excellence; Strategies to enhance Emotional Intelligence.

Reference Books:

- 1) Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
- 2) S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.
- 3) R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.
- 4) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.
- 5) Managing Soft Skills for Personality Development – edited by B.N.Ghosh, McGraw Hill India, 2012.
- 6) English and Soft Skills – S.P.Dhanavel, Orient Blackswan India, 2010.



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III Year – II Semester	L	T	P	C
	3	0	0	3
DATA WAREHOUSING AND DATA MINING				

Course Objectives:

- To understand data warehouse concepts, architecture, business analysis and tools
- To understand data pre-processing and data visualization techniques
- To study algorithms for finding hidden and interesting patterns in data
- To understand and apply various classification and clustering techniques using tools

Course Outcomes:

At the end of the course, the students will be able to:

- Design a Data warehouse system and perform business analysis with OLAP tools
- Apply suitable pre-processing and visualization techniques for data analysis
- Apply frequent pattern and association rule mining techniques for data analysis
- Apply appropriate classification techniques for data analysis
- Apply appropriate clustering techniques for data analysis

UNIT I

Data Warehousing, Business Analysis and On-Line Analytical Processing (OLAP): Basic Concepts, Data Warehousing Components, Building a Data Warehouse, Database Architectures for Parallel Processing, Parallel DBMS Vendors, Multidimensional Data Model, Data Warehouse Schemas for Decision Support, Concept Hierarchies, Characteristics of OLAP Systems, Typical OLAP Operations, OLAP and OLTP.

UNIT II

Introduction to Data Mining Systems, Knowledge Discovery Process, Data Mining Techniques, Issues, applications, Data Objects and attribute types, Statistical description of data, Data Preprocessing – Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.

UNIT III

Frequent Pattern Analysis: Mining Frequent Patterns, Associations and Correlations, Mining Methods, Pattern Evaluation Method, Pattern Mining in Multilevel, Multi-Dimensional Space – Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns

UNIT IV

Classification: Decision Tree Induction, Bayesian Classification, Rule Based Classification, Classification by Back Propagation, Support Vector Machines, Lazy Learners, Model Evaluation and Selection, Techniques to improve Classification Accuracy

UNIT V

Clustering: Clustering Techniques, Cluster analysis, Partitioning Methods, Hierarchical methods, Density Based Methods, Grid Based Methods, Evaluation of clustering, Clustering high dimensional data, Clustering with constraints, Outlier analysis, outlier detection methods.



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Text Books:

- 1) Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2012.
- 2) Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Introduction to Data Mining, Pearson, 2016.

Reference Books:

- 1) Alex Berson and Stephen J. Smith, —Data Warehousing, Data Mining & OLAP, Tata McGraw – Hill Edition, 35th Reprint 2016.
- 2) K.P. Soman, ShyamDiwakar and V. Ajay, —Insight into Data Mining Theory and Practice, Eastern Economy Edition, Prentice Hall of India, 2006.
- 3) Ian H. Witten and Eibe Frank, —Data Mining: Practical Machine Learning Tools and Techniques, Elsevier, Second Edition.

e-Resources:

- 1) https://www.saedsayad.com/data_mining_map.htm
- 2) <https://nptel.ac.in/courses/106/105/106105174/>
- 3) (NPTEL course by Prof. Pabitra Mitra) http://onlinecourses.nptel.ac.in/noc17_mg24/preview
- 4) (NPTEL course by Dr. Nandan Sudarshanam & Dr. Balaraman Ravindran) http://www.saedsayad.com/data_mining_map.htm



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DEPARTMENT OF INFORMATION TECHNOLOGY

III Year – II Semester	Open Elective –I	L	T	P	C
		3	0	0	3

Note: The student has to take any one **open elective course** offered in the other departments (or) SWAYAM/NPTEL courses offered by other than parent department. (12 week minimum).

Given below are some of the courses offered by NPTEL/SWAYAM

<p>Electronics & Communication Engineering</p> <ol style="list-style-type: none"> 1) Information Coding Theory 2) VLSI Design 3) Signals & Systems 4) Digital Signal Processing 	<p>Mathematics</p> <ol style="list-style-type: none"> 1) Optimization Techniques 2) Computational Number Theory and Cryptography
<p>Electrical and Electronics Engineering</p> <ol style="list-style-type: none"> 1) Networking Analysis 2) Fuzzy Sets, Logic and Systems & Applications 3) Energy Management Systems and SCADA 4) Industrial Safety Engineering 	<p>Civil Engineering</p> <ol style="list-style-type: none"> 1) Intelligent transportation engineering 2) Remote Sensing and GI 3) Engineering Mechanics 4) City and Metropolitan Planning 5) Sustainable Materials and Green Buildings
<p>Mechanical Engineering</p> <ol style="list-style-type: none"> 1) Industrial Automation and Control 2) Robotics 3) CAD 4) Mechatronics And Manufacturing Automation 5) Non Conventional Energy Resources 	



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DEPARTMENT OF INFORMATION TECHNOLOGY

III Year – II Semester		L	T	P	C
		3	0	0	3
WEB TECHNOLOGIES					

Course Objectives:

From the course the student will learn

- Translate user requirements into the overall architecture and implementation of new systems and Manage Project and coordinate with the Client
- Write backend code in PHP language and Writing optimized front end code HTML and JavaScript
- Understand, create and debug database related queries and Create test code to validate the applications against client requirement
- Monitor the performance of web applications & infrastructure and Troubleshooting web application with a fast and accurate a resolution

Course Outcomes:

- Illustrate the basic concepts of HTML and CSS & apply those concepts to design static web pages.
- Identify and understand various concepts related to dynamic web pages and validate them using JavaScript
- Outline the concepts of Extensible markup language & AJAX
- Develop web Applications using Scripting Languages & Frameworks
- Create and deploy secure, usable database driven web applications using PHP and RUBY

UNIT I

HTML: Basic Syntax, Standard HTML Document Structure, Basic Text Markup, Html styles, Elements, Attributes, Heading, Layouts, Html media, Iframes Images, Hypertext Links, Lists, Tables, Forms, GET and POST method, HTML 5, Dynamic HTML.

CSS: Cascading style sheets, Levels of Style Sheets, Style Specification Formats, Selector Forms, The Box Model, Conflict Resolution, CSS3.

UNIT II

Javascript - Introduction to Javascript, Objects, Primitives Operations and Expressions, Control Statements, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions, Fundamentals of Angular JS and NODE JS Angular Java Script- Introduction to Angular JS Expressions: ARRAY, Objects, Strings, Angular JS Form Validation & Form Submission.

Node.js- Introduction, Advantages, Node.js Process Model, Node JS Modules, Node JS File system, Node JS URL module, Node JS Events.

UNIT III

Working with XML: Document type Definition (DTD), XML schemas, XSLT, Document object model, Parsers - DOM and SAX.

AJAX A New Approach: Introduction to AJAX, Basics of AJAX, XML Http Request Object, AJAX UI tags, Integrating PHP and AJAX.



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UNIT IV

PHP Programming: Introduction to PHP, Creating PHP script, Running PHP script. Working with variables and constants: Using variables, Using constants, Data types, Operators. Controlling program flow: Conditional statements, Control statements, Arrays, functions.

UNIT V

Web Servers- IIS (XAMPP, LAMP) and Tomcat Servers. Java Web Technologies-Introduction to Servlet, Life cycle of Servlet, Servlet methods, Java Server Pages.

Database connectivity – Servlets, JSP, PHP, Practice of SQL Queries.

Introduction to Mongo DB and JQuery.

Web development frameworks – Introduction to Ruby, Ruby Scripting, Ruby on rails, Design, Implementation and Maintenance aspects.

Text Books:

- 1) Programming the World Wide Web, 7th Edition, Robert W Sebesta, Pearson, 2013.
- 2) Web Technologies, 1st Edition 7th impression, Uttam K Roy, Oxford, 2012.
- 3) Pro Mean Stack Development, 1st Edition, ELad Elrom, Apress O'Reilly, 2016
- 4) Java Script & jQuery the missing manual, 2nd Edition, David sawyer mcfarland, O'Reilly, 2011.
- 5) Web Hosting for Dummies, 1st Edition, Peter Pollock, John Wiley & Sons, 2013
- 6) RESTful web services, 1st Edition, Leonard Richardson, Ruby, O'Reilly, 2007

Reference Books:

- 1) Ruby on Rails Up and Running, Lightning fast Web development, 1st Edition, Bruce Tate, Curt Hibbs, Oreilly, 2006.
- 2) Programming Perl, 4th Edition, Tom Christiansen, Jonathan Orwant, O'Reilly, 2012.
- 3) Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, 1st Edition, Dream Tech, 2009.
- 4) An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda S Katila, Cengage Learning, 2003.



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III Year – II Semester		L	T	P	C
		3	0	0	3
PROFESSIONAL ELECTIVE -II					

(NPTEL/SWAYAM) Course

Duration: 12 Weeks Minimum

***Course/subject title can't be repeated**

12 Weeks NPTEL Courses by NPTEL/SWAYAM courses

- 1) Introduction to Industry 4.0 and Industrial Internet of Things
- 2) AI: Knowledge Representation and Reasoning
- 3) Synthesis of Digital Systems
- 4) Privacy and Security in Online Social Media
- 5) Block chain architecture design and use cases
- 6) Machine Learning for Engineering and Science Applications
- 7) Randomized Algorithms
- 8) Parallel Algorithms
- 9) Hardware Security

Note: The courses listed here are just few examples. The student can take courses offered in CSE/IT discipline which are 12 weeks minimum duration.



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III Year – II Semester	L	T	P	C
	3	0	0	3
MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTANCY				

Course Objectives:

- The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting.
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis.
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles.
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation.
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals.

Unit-I

Introduction to Managerial Economics and demand Analysis:

Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects – Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

Unit – II:

Theories of Production and Cost Analyses:

Theories of Production function- Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

Unit – III:

Introduction to Markets, Theories of the Firm & Pricing Policies:

Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson’s models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles : Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms.

Unit – IV:

Introduction to Accounting & Financing Analysis:

Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis (Problems)



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Unit – V:

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(pay back period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Course Outcomes:

- The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product.
- The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs.
- The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.
- The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis.
- The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

TEXT BOOKS:

A R Aryasri, Managerial Economics and Financial Analysis, The McGraw – Hill companies.

REFERENCES:

1. Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & Company Ltd,
2. JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition edition
3. N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & Company Ltd,
4. MaheswariS.N,AnIntroduction to Accountancy, Vikas Publishing House Pvt Ltd
5. I.M Pandey, Financial Management , Vikas Publishing House Pvt Ltd
6. V. Maheswari, Managerial Economics, S. Chand & Company Ltd,



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III Year – II Semester		L	T	P	C
		0	0	3	1.5
WEB TECHNOLOGIES LAB					

Course Objectives:

From the course the student will

- Learn the core concepts of both the frontend and backend programming course
- Get familiar with the latest web development technologies
- Learn all about PHP and SQL databases
- Learn complete web development process

Course Outcomes:

By the end of the course the student will be able to

- Analyze and apply the role of languages like HTML, CSS, XML
- Review JavaScript, PHP and protocols in the workings of the web and web applications
- Apply Web Application Terminologies, Internet Tools, E – Commerce and other web services
- Develop and Analyze dynamic Web Applications using PHP & MySQL
- Install & Use Frameworks

List of Experiments:

- 1) Design the following static web pages required for an online book store web site:

(a) **HOME PAGE:**

The static home page must contain three **frames**.

Top frame: Logo and the college name and links to Home page, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below).

Left frame: At least four links for navigation, which will display the catalogue of respective links.

For e.g.: When you click the link “MCA” the catalogue for MCA Books should be displayed in the Right frame.

Right frame: The *pages to the links in the left frame must be loaded here*. Initially this page contains description of the web site.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
mca mba BCA	Description of the Web Site			



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(b) LOGIN PAGE:

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
MCA MBA BCA	Login : <input type="text" value="11a51f0003"/> Password: <input type="password" value="*****"/> <input type="button" value="Submit"/> <input type="button" value="Reset"/>			

(c) CATALOGUE PAGE:

The catalogue page should contain the details of all the books available in the web site in a table:
 The details should contain the following:

1. Snap shot of Cover Page.
2. Author Name.
3. Publisher.
4. Price.
5. Add to cart button.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
MCA MBA BCA	   	Book : XML Bible Author : Winston Publication : Wiley Book : AI Author : S.Russel Publication : Princeton hall Book : Java 2 Author : Watson Publication : BPB publications Book : HTML in 24 hours Author : Sam Peter Publication : Sam	\$ 40.5 \$ 63 \$ 35.5 \$ 50	<input type="button" value="Add to cart"/> <input type="button" value="Add to cart"/> <input type="button" value="Add to cart"/> <input type="button" value="Add to cart"/>

(d). REGISTRATION PAGE:

Create a “registration form “with the following fields

- 1) Name (Text field)
- 2) Password (password field)
- 3) E-mail id (text field)
- 4) Phone number (text field)
- 5) Sex (radio button)
- 6) Date of birth (3 select boxes)
- 7) Languages known (check boxes – English, Telugu, Hindi, Tamil)



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- 8) Address (text area)
- 2) Design a web page using **CSS (Cascading Style Sheets)** which includes the following: Use different font, styles:
In the style definition you define how each selector should work (font, color etc.).
Then, in the body of your pages, you refer to these selectors to activate the styles
- 3) Design a dynamic web page with validation using JavaScript.
- 4) Design a HTML having a text box and four buttons viz Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate javascript function should be called to display
- Factorial of that number
 - Fibonacci series up to that number
 - Prime numbers up to that number
 - Is it palindrome or not
- 5) Write JavaScript programs on Event Handling
- Validation of registration form
 - Open a Window from the current window
 - Change color of background at each click of button or refresh of a page
 - Display calendar for the month and year selected from combo box
 - On Mouse over event
- 6) Write an XML file which will display the Book information which includes the following:
- Title of the book
 - Author Name
 - ISBN number
 - Publisher name
 - Edition
 - Price
- Write a Document Type Definition (DTD) to validate the above XML file.
 - Write a XML Schema Definition (XSD) to validate the above XML file.
- 7) Create Web pages using AJAX.
- 8) User Authentication:
Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a PHP for doing the following.
- Create a Cookie and add these four user id's and passwords to this Cookie.
 - Read the user id and passwords entered in the Login form (week1) and authenticate with the values (user id and passwords) available in the cookies.
If he is a valid user (i.e., user-name and password match) you should welcome him by name (user-name) else you should display "You are not an authenticated user".
Use init-parameters to do this.
- 9) Example PHP program for registering users of a website and login.
- 10) Install a database (Mysql or Oracle).



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Create a table which should contain at least the following fields: name, password, email-id, phone number (these should hold the data from the registration form).

Write a PHP program to connect to that database and extract data from the tables and display them. Experiment with various SQL queries.

Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page (week2).

11) Write a PHP which does the following job:

Insert the details of the 3 or 4 users who register with the web site (week9) by using registration form. Authenticate the user when he submits the login form using the user name and password from the database (similar to week8 instead of cookies).

12) Implement a Servlet program on request response processing.

13) Implement a Servlet program for Registration Page.

14) Connect to a database using JSP and practice SQL Queries (MySql or Oracle).



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III Year – II Semester		L	T	P	C
		0	0	3	1.5
DATA MINING LAB					

Course Objectives:

- To understand the mathematical basics quickly and covers each and every condition of data mining in order to prepare for real-world problems
- The various classes of algorithms will be covered to give a foundation to further apply knowledge to dive deeper into the different flavors of algorithms
- Students should aware of packages and libraries of R and also familiar with functions used in R for visualization
- To enable students to use R to conduct analytics on large real life datasets
- To familiarize students with how various statistics like mean median etc

Course Outcomes:

At the end of the course, student will be able to

- Extend the functionality of R by using add-on packages
- Examine data from files and other sources and perform various data manipulation tasks on them
- Code statistical functions in R
- Use R Graphics and Tables to visualize results of various statistical operations on data
- Apply the knowledge of R gained to data Analytics for real life applications

List of Experiments:

1. Implement all basic R commands.
2. Interact data through .csv files (Import from and export to .csv files).
3. Get and Clean data using swirl exercises. (Use ‘swirl’ package, library and install that topic from swirl).
4. Visualize all Statistical measures (Mean, Mode, Median, Range, Inter Quartile Range etc., using Histograms, Boxplots and Scatter Plots).
5. Create a data frame with the following structure.

EMP ID	EMP NAME	SALARY	START DATE
1	Satish	5000	01-11-2013
2	Vani	7500	05-06-2011
3	Ramesh	10000	21-09-1999
4	Praveen	9500	13-09-2005
5	Pallavi	4500	23-10-2000

- a) Extract two column names using column name.
 - b) Extract the first two rows and then all columns.
 - c) Extract 3rd and 5th row with 2nd and 4th column.
6. Write R Program using ‘apply’ group of functions to create and apply normalization function on each of the numeric variables/columns of iris dataset to transform them into
 - i) 0 to 1 range with min-max normalization.
 - ii) a value around 0 with z-score normalization.



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7. Create a data frame with 10 observations and 3 variables and add new rows and columns to it using 'rbind' and 'cbind' function.
8. Write R program to implement linear and multiple regression on 'mtcars' dataset to estimate the value of 'mpg' variable, with best R^2 and plot the original values in 'green' and predicted values in 'red'.
9. Implement k-means clustering using R.
10. Implement k-medoids clustering using R.
11. implement density based clustering on iris dataset.
12. implement decision trees using 'readingSkills' dataset.
13. Implement decision trees using 'iris' dataset using package party and 'rpart'.
14. Use a Corpus() function to create a data corpus then Build a term Matrix and Reveal word frequencies.

Text Books:

- 1) R and Data Mining: Examples and Case Studies, 1st ed, Yanchang Zhao, Springer, 2012.
- 2) R for Everyone, Advanced Analytics and Graphics, 2nd ed, Jared Lander, Pearson, 2018.

e-Resources:

- 1) www.r-tutor.com



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III Year – II Semester		L	T	P	C
		0	0	0	1
Industrial Training / Skill Development Programmes / Research Project in Higher Learning Institutes					

Note: The Industrial Training / Skill Development Programmes / Research Project in higher learning institutes should be taken during the semester gap between II B.Tech-II Semester and III B.Tech-I Semester for a period of 4 weeks.



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IV Year – I Semester		L	T	P	C
		3	0	0	3
CRYPTOGRAPHY AND NETWORK SECURITY					

Course Objectives:

This course aims at training students to master the:

- The concepts of classical encryption techniques and concepts of finite fields and number theory
- Working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms
- Design issues and working principles of various authentication protocols, PKI standards
- Various secure communication standards including Kerberos, IPsec, and SSL/TLS and email
- Concepts of cryptographic utilities and authentication mechanisms to design secure applications

Course Outcomes:

By the end of the course the student

- Identify information security goals, classical encryption techniques and acquire fundamental knowledge on the concepts of finite fields and number theory
- Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication
- Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes
- Apply different digital signature algorithms to achieve authentication and create secure applications
- Apply network security basics, analyze different attacks on networks and evaluate the performance of firewalls and security protocols like SSL, IPSec, and PGP
- Apply the knowledge of cryptographic utilities and authentication mechanisms to design secure applications

UNIT I

Classical Encryption Techniques: Security Attacks, Services & Mechanisms, Symmetric Cipher Model. Cyber Threats, Phishing Attack, Web Based Attacks, SQL Injection Attacks, Buffer Overflow & Format String Vulnerabilities, TCP session hijacking, UDP Session Hijacking. Block Ciphers: Traditional Block Cipher Structure, Block Cipher Design Principles.

UNIT II

Symmetric Key Cryptography: Data Encryption Standard (DES), Advanced Encryption Standard (AES), Blowfish, IDEA, Block Cipher Modes of Operations. Number Theory: Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems, The Chinese Remainder Theorem, Discrete Logarithms.



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UNIT III

Public Key Cryptography: Principles, Public Key Cryptography Algorithms, RSA Algorithm, Diffie Hellman Key Exchange, Elliptic Curve Cryptography. Cryptographic Hash Functions: Application of Cryptographic Hash Functions, Requirements & Security, Secure Hash Algorithm, Message Authentication Functions, Requirements & Security, HMAC & CMAC. Digital Signatures: NIST Digital Signature Algorithm, Key Management and Distribution.

UNIT IV

User Authentication: Remote User Authentication Principles, Kerberos. Electronic Mail Security: Pretty Good Privacy (PGP) And S/MIME. IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

UNIT V

Transport Level Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security(TLS), Secure Shell(SSH).

Firewalls: Characteristics, Types of Firewalls, Placement of Firewalls, Firewall Configuration, Trusted Systems.

Text Books:

- 1) Cryptography and Network Security- William Stallings, Pearson Education, 7th Edition.
- 2) Cryptography, Network Security and Cyber Laws – Bernard Menezes, Cengage Learning, 2010 edition.

Reference Books:

- 1) Cryptography and Network Security- Behrouz A Forouzan, Debdeep Mukhopadhyay, McGrawHill, 3rd Edition, 2015.
- 2) Network Security Illustrated, Jason Albanese and Wes Sonnenreich, MGH Publishers, 2003.

e-Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105031/> lecture by Dr. Debdeep Mukhopadhyay IIT Kharagpur [Video Lecture]
- 2) <https://nptel.ac.in/courses/106/105/106105162/> lecture by Dr. Sourav Mukhopadhyay IIT Kharagpur [Video Lecture]
- 3) <https://www.mitel.com/articles/web-communication-cryptography-and-network-security> web articles by Mitel Power Connections



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IV Year – I Semester		L	T	P	C
		3	1	0	4
MACHINE LEARNING					

Course Objectives:

The course is introduced for students to

- Gain knowledge about basic concepts of Machine Learning
- Study about different learning algorithms
- Learn about of evaluation of learning algorithms
- Learn about artificial neural networks

Course Outcomes:

- Identify machine learning techniques suitable for a given problem
- Solve the problems using various machine learning techniques
- Apply Dimensionality reduction techniques
- Design application using machine learning techniques

UNIT I

Introduction: Definition of learning systems, Goals and applications of machine learning, Aspects of developing a learning system: training data, concept representation, function approximation.

Inductive Classification: The concept learning task, Concept learning as search through a hypothesis space, General-to-specific ordering of hypotheses, Finding maximally specific hypotheses, Version spaces and the candidate elimination algorithm, Learning conjunctive concepts, The importance of inductive bias.

UNIT II

Decision Tree Learning: Representing concepts as decision trees, Recursive induction of decision trees, Picking the best splitting attribute: entropy and information gain, Searching for simple trees and computational complexity, Occam's razor, Overfitting, noisy data, and pruning.

Experimental Evaluation of Learning Algorithms: Measuring the accuracy of learned hypotheses. Comparing learning algorithms: cross-validation, learning curves, and statistical hypothesis testing.

UNIT III

Computational Learning Theory: Models of learnability: learning in the limit; probably approximately correct (PAC) learning. Sample complexity for infinite hypothesis spaces, Vapnik-Chervonenkis dimension.

Rule Learning: Propositional and First-Order, Translating decision trees into rules, Heuristic rule induction using separate and conquer and information gain, First-order Horn-clause induction (Inductive Logic Programming) and Foil, Learning recursive rules, Inverse resolution, Golem, and Progol.

UNIT IV

Artificial Neural Networks: Neurons and biological motivation, Linear threshold units. Perceptrons: representational limitation and gradient descent training, Multilayer networks and backpropagation, Hidden layers and constructing intermediate, distributed representations. Overfitting, learning network structure, recurrent networks.

Support Vector Machines: Maximum margin linear separators. Quadratic programming solution to



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finding maximum margin separators. Kernels for learning non-linear functions.

UNIT V

Bayesian Learning: Probability theory and Bayes rule. Naive Bayes learning algorithm. Parameter smoothing. Generative vs. discriminative training. Logistic regression. Bayes nets and Markov nets for representing dependencies.

Instance-Based Learning: Constructing explicit generalizations versus comparing to past specific examples. k-Nearest-neighbor algorithm. Case-based learning.

Text Books:

- 1) T.M. Mitchell, “Machine Learning”, McGraw-Hill, 1997.
- 2) Machine Learning, Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, Pearson, 2019.

Reference Books:

- 1) Ethern Alpaydin, “Introduction to Machine Learning”, MIT Press, 2004.
- 2) Stephen Marsland, “Machine Learning -An Algorithmic Perspective”, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
- 3) Andreas C. Müller and Sarah Guido “Introduction to Machine Learning with Python: A Guide for Data Scientists”, O'Reilly.

e-Resources:

- 1) Andrew Ng, “Machine Learning Yearning” <https://www.deeplearning.ai/machine-learning-yearning/>
- 2) Shai Shalev-Shwartz , Shai Ben-David, “Understanding Machine Learning: From Theory to Algorithms” , Cambridge University Press
<https://www.cse.huji.ac.il/~shais/UnderstandingMachineLearning/index.html>



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IV Year – I Semester		L	T	P	C
		3	0	0	3
ADVANCED COMPUTER NETWORKS					

Course Objectives:

This course is aimed at enabling the students to

- Gain core knowledge of Network layer routing protocols and IP addressing.
- Study Session layer design issues, Transport layer services, and protocols.
- Acquire knowledge of Application layer and Presentation layer paradigms and protocols.
- Provide the mathematical background of routing protocols.
- To develop some familiarity with current research problems and research methods in advance computer networks.

Course Outcomes:

After the completion of the course, student will be able to

- Illustrate reference models with layers, protocols and interfaces
- Describe the routing algorithms, Sub netting and Addressing of IP V4and IPV6
- Describe and Analysis of basic protocols of computer networks, and how they can be used to assist in network design and implementation
- Describe the concepts Wireless LANS, WIMAX, IEEE 802.11, Cellular telephony and Satellite networks

UNIT I

Network layer: Network Layer Services, Packet Switching, Performance, provided transport layers, implementation connectionless services, implementation connection oriented services, comparison of virtual –circuit and datagram subnets. IPV4 Address, Forwarding of IP Packets, Internet Protocol, ICMP v4, Mobile IP

UNIT II

Routing Algorithms–Distance Vector routing, Link State Routing, Path Vector Routing, Unicast Routing Protocol- Internet Structure, Routing Information Protocol, Open Source Path First, Border Gateway Protocol V4, Broadcast routing, Multicasting routing, Multicasting Basics, Intradomain Muticast Protocols, IGMP.

UNIT III

IPv6 Addressing, IPv6 Protocol, Transition from IPv4 to IPv6.

Transport Layer Services, connectionless versus connection oriented protocols. Transport Layer Protocols: Simple Protocol, Stop and Wait, Go-Back-N, Selective repeat, Piggy Backing.

UDP: User datagram, Services, Applications.

TCP: TCP services, TCP features, segment, A TCP connection, Flow control, error control, congestion control.



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UNIT IV

SCTP: SCTP services SCTP features, packet format, An SCTP association, flow control, error control.
QUALITY OF SERVICE: flow characteristics, flow control to improve QOS: scheduling, traffic shaping, resource reservation, admission control.

UNIT V

WWW and HTTP, FTP, Telnet, Domain name system, SNMP, Multimedia data, Multimedia in the Internet.

Text Books:

- 1) Data Communication and Networking , Behrouz A. Forouzan, McGraw Hill, 5th Edition, 2012
- 2) Computer Networks , Andrew S. Tanenbaum, David J. Wetherall, Pearson Education India; 5 edition, 2013.

Reference Books:

- 1) Computer networks, Mayank Dave, CENGAGE.
- 2) Computer Networks: A Systems Approach , LL Peterson, BS Davie, Morgan-Kauffman , 5th Edition, 2011.
- 3) Computer Networking: A Top-Down Approach JF Kurose, KW Ross, Addison-Wesley , 5th Edition, 2009.

e-Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105183/>



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IV Year – I Semester	L	T	P	C
	3	0	0	3
Open Elective II				

Note: The student has to take any one **open elective course** offered in the other departments (or) SWAYAM/NPTEL courses offered by other than parent department. (12 week minimum).

Given below are some of the courses offered by NPTEL/SWAYAM

<p>Electronics & Communication Engineering</p> <ol style="list-style-type: none"> 1) Information Coding Theory 2) VLSI Design 3) Signals & Systems 4) Digital Signal Processing 	<p>Mathematics</p> <ol style="list-style-type: none"> 1) Optimization Techniques 2) Computational Number Theory and Cryptography
<p>Electrical and Electronics Engineering</p> <ol style="list-style-type: none"> 1) Networking Analysis 2) Fuzzy Sets, Logic and Systems & Applications 3) Energy Management Systems and SCADA 4) Industrial Safety Engineering 	<p>Civil Engineering</p> <ol style="list-style-type: none"> 1) Intelligent transportation engineering 2) Remote Sensing and GI 3) Engineering Mechanics 4) City and Metropolitan Planning 5) Sustainable Materials and Green Buildings
<p>Mechanical Engineering</p> <ol style="list-style-type: none"> 1) Industrial Automation and Control 2) Robotics 3) CAD 4) Mechatronics And Manufacturing Automation 5) Non Conventional Energy Resources 	



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		3	0	0	3
BIG DATA ANALYTICS					

Course Objectives:

- To optimize business decisions and create competitive advantage with Big Data analytics
- To learn to analyze the big data using intelligent techniques
- To introduce programming tools PIG & HIVE in Hadoop ecosystem

Course Outcomes:

At the end of the course, the students will be able to

- Illustrate big data challenges in different domains including social media, transportation, finance and medicine
- Use various techniques for mining data stream
- Design and develop Hadoop
- Identify the characteristics of datasets and compare the trivial data and big data for various applications
- Explore the various search methods and visualization techniques

UNIT I

Introduction: Introduction to big data: Introduction to Big Data Platform, Challenges of Conventional Systems, Intelligent data analysis, Nature of Data, Analytic Processes and Tools, Analysis vs Reporting.

UNIT II

Stream Processing: Mining data streams: Introduction to Streams Concepts, Stream Data Model and Architecture, Stream Computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Oneness in a Window, Decaying Window, Real time Analytics Platform (RTAP) Applications, Case Studies - Real Time Sentiment Analysis - Stock Market Predictions.

UNIT III

Introduction to Hadoop: History of Hadoop, the Hadoop Distributed File System, Components of Hadoop Analysing the Data with Hadoop, Scaling Out, Hadoop Streaming, Design of HDFS, Java interfaces to HDFS Basics, Developing a Map Reduce Application, How Map Reduce Works, Anatomy of a Map Reduce Job run, Failures, Job Scheduling, Shuffle and Sort, Task execution, Map Reduce Types and Formats, Map Reduce Features Hadoop environment

UNIT IV

Frameworks and Applications: Frameworks: Applications on Big Data Using Pig and Hive, Data processing operators in Pig, Hive services, HiveQL, Querying Data in Hive, fundamentals of HBase and ZooKeeper.



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DEPARTMENT OF INFORMATION TECHNOLOGY

UNIT V

Predictive Analytics and Visualizations: Predictive Analytics, Simple linear regression, Multiple linear regression, Interpretation of regression coefficients, Visualizations, Visual data analysis techniques, interaction techniques, Systems and application

Text Books:

- 1) Tom White, “Hadoop: The Definitive Guide”, Third Edition, O’reilly Media, Fourth Edition, 2015.
- 2) Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data”, McGrawHill Publishing, 2012.
- 3) Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, CUP, 2012.

Reference Books:

- 1) Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.
- 2) Paul Zikopoulos, Dirk deRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, “Harness the Power of Big Data: The IBM Big Data Platform”, Tata McGraw Hill Publications, 2012.
- 3) Arshdeep Bahga and Vijay Madisetti, “Big Data Science & Analytics: A Hands On Approach”, VPT, 2016.
- 4) Bart Baesens, “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)”, John Wiley & Sons, 2014.



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DEPARTMENT OF INFORMATION TECHNOLOGY

IV Year – I Semester		L	T	P	C
		3	0	0	3
SOCIAL NETWORKING					

Course Objectives:

- Formalize different types of entities and relationships as nodes and edges and represent this information as relational data
- Plan and execute network analytical computations
- Use advanced network analysis software to generate visualizations and perform empirical investigations of network data
- Interpret and synthesize the meaning of the results with respect to a question, goal, or task
- Collect network data in different ways and from different sources while adhering to legal standards and ethics standards

Course Outcomes:

After completing the course student should:

- Know basic notation and terminology used in network science
- Be able to visualize, summarize and compare networks
- Illustrate basic principles behind network analysis algorithms
- Develop practical skills of network analysis in R programming language
- Be capable of analyzing real work networks

UNIT I

Social Network Analysis: Preliminaries and definitions, Erdos Number Project, Centrality measures, Balance and Homophily.

UNIT II

Random graph models: Random graphs and alternative models, Models of network growth, Navigation in social Networks, Cohesive subgroups, Multidimensional Scaling, Structural equivalence, roles and positions.

UNIT III

Network topology and diffusion, Contagion in Networks, Complex contagion, Percolation and information, Navigation in Networks Revisited.

UNIT IV

Small world experiments, small world models, origins of small world, Heavy tails, Small Diameter, Clustering of connectivity, The ErdosRenyi Model, Clustering Models.

UNIT V

Network structure -Important vertices and page rank algorithm, towards rational dynamics in networks, basics of game theory, Coloring and consensus, biased voting, network formation games, network structure and equilibrium, behavioral experiments, Spatial and agent-based models.



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Text Books:

- 1) S. Wasserman and K. Faust. “Social Network Analysis: Methods and Applications”, Cambridge University Press.
- 2) D. Easley and J. Kleinberg, “Networks, Crowds and Markets: Reasoning about a highly connected world” , Cambridge University Press, 1st edition,2010

Reference Books:

- 1) Maarten van Steen. “Graph Theory and Complex Networks. An Introduction”, 2010.
- 2) Reza Zafarani, Mohammed Ali Abbasi, Huan Liu. “Social Media Mining: An Introduction”. Cambridge University Press 2014.
- 3) Maksim Tsvetovat and Alexander Kouznetsov. “Social Network Analysis for Startups”. O’Reilly Media, 2011.

e-Resources:

- 1) <https://www.classcentral.com/course/edx-social-network-analysis-sna-9134>
- 2) <https://www.coursera.org/learn/social-network-analysis>



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IV Year – I Semester		L	T	P	C
		3	0	0	3
AD-HOC AND SENSOR NETWORKS					

Course Objectives:

From the course the student will learn

- Architect sensor networks for various application setups
- Devise appropriate data dissemination protocols and model links cost
- Understanding of the fundamental concepts of wireless sensor networks and has a basic knowledge of the various protocols at various layers
- Evaluate the performance of sensor networks and identify bottlenecks

Course Outcomes:

- Evaluate the principles and characteristics of mobile ad hoc networks (MANETs) and what distinguishes them from infrastructure-based networks
- Determine the principles and characteristics of wireless sensor networks
- Discuss the challenges in designing MAC, routing and transport protocols for wireless ad-hoc sensor networks
- Illustrate the various sensor network Platforms, tools and applications
- Demonstrate the issues and challenges in security provisioning and also familiar with the mechanisms for implementing security and trust mechanisms in MANETs and WSNs

UNIT I

Introduction to Ad Hoc Wireless Networks- Cellular and Ad Hoc Wireless Networks, Characteristics of MANETs, Applications of MANETs, Issues and Challenges of MANETs, Ad Hoc Wireless Internet, MAC protocols for Ad hoc Wireless Networks-Issues, Design Goals and Classifications of the MAC Protocols.

UNIT II

Routing Protocols for Ad Hoc Wireless Networks- Issues in Designing a Routing Protocol, Classifications of Routing Protocols, Topology-based versus Position-based Approaches, Issues and design goals of a Transport layer protocol, Classification of Transport layer solutions, TCP over Ad hoc Wireless Networks, Solutions for TCP over Ad Hoc Wireless Networks, Other Transport layer protocols.

UNIT III

Security protocols for Ad hoc Wireless Networks- Security in Ad hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad hoc Wireless Networks, Cooperation in MANETs, Intrusion Detection Systems.

UNIT IV

Basics of Wireless Sensors and Applications- The Mica Mote, Sensing and Communication Range, Design Issues, Energy Consumption, Clustering of Sensors, Applications, Data Retrieval in Sensor Networks-Classification of WSNs, MAC layer, Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.



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UNIT V

Security in WSNs- Security in WSNs, Key Management in WSNs, Secure Data Aggregation in WSNs, Sensor Network Hardware-Components of Sensor Mote, Sensor Network Operating Systems–TinyOS, LA-TinyOS, SOS, RETOS, Imperative Language-nesC, Dataflow Style Language- TinyGALS, Node-Level Simulators, NS-2 and its sensor network extension, TOSSIM.

Text Books:

- 1) Ad Hoc Wireless Networks – Architectures and Protocols, C. Siva Ram Murthy, B. S. Murthy, Pearson Education, 2004.
- 2) Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P. Aggarwal, World Scientific Publications / Cambridge University Press, March 2006.
- 3) Wireless Sensor Networks – Principles and Practice, Fei Hu, Xiaojun Cao, An Auerbach book, CRC Press, Taylor & Francis Group, 2010.

Reference Books:

- 1) Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science imprint, Morgan Kauffman Publishers, 2005, rp2009.
- 2) Wireless Ad hoc Mobile Wireless Networks – Principles, Protocols and Applications, Subir Kumar Sarkar, et al., Auerbach Publications, Taylor & Francis Group, 2008.
- 3) Ad hoc Networking, Charles E. Perkins, Pearson Education, 2001
- 4) Wireless Ad hoc Networking, Shih-Lin Wu, Yu-Chee Tseng, Auerbach Publications, Taylor & Francis Group, 2007.



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IV Year – I Semester		L	T	P	C
		3	0	0	3
CLOUD COMPUTING					

Course Objectives:

- To implement Virtualization
- To implement Task Scheduling algorithms
- Apply Map-Reduce concept to applications
- To build Private Cloud
- Broadly educate to know the impact of engineering on legal and societal issues involved

Course Outcomes:

At the end of the course, student will be able to

- Interpret the key dimensions of the challenge of Cloud Computing
- Examine the economics, financial, and technological implications for selecting cloud computing for own organization
- Assessing the financial, technological, and organizational capacity of employer’s for actively initiating and installing cloud-based applications
- Evaluate own organizations’ needs for capacity building and training in cloud computing-related IT areas
- Illustrate Virtualization for Data-Center Automation

UNIT I

Introduction: Network centric computing, Network centric content, peer-to –peer systems, cloud computing delivery models and services, Ethical issues, Vulnerabilities, Major challenges for cloud computing.

Parallel and Distributed Systems: introduction, architecture, distributed systems, communication protocols, logical clocks, message delivery rules, concurrency, and model concurrency with Petri Nets.

UNIT II

Cloud Infrastructure: At Amazon, The Google Perspective, Microsoft Windows Azure, Open Source Software Platforms, Cloud storage diversity, Inter cloud, energy use and ecological impact, responsibility sharing, user experience, Software licensing.

Cloud Computing : Applications and Paradigms: Challenges for cloud, existing cloud applications and new opportunities, architectural styles, workflows, The Zookeeper, HPC on cloud.

UNIT III

Cloud Resource virtualization: Virtualization, layering and virtualization, virtual machine monitors, virtual machines, virtualization- full and para, performance and security isolation, hardware support for virtualization, Case Study: Xen, vBlades.

Cloud Resource Management and Scheduling: Policies and Mechanisms, Applications of control theory to task scheduling, Stability of a two-level resource allocation architecture, feedback control based on dynamic thresholds, coordination, resource bundling, scheduling algorithms, fair queuing, start time fair queuing, cloud scheduling subject to deadlines, Scheduling Map Reduce applications, Resource management and dynamic application scaling



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UNIT IV

Storage Systems: Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system. Apache Hadoop, Big Table, Megastore (Text book 1), Amazon Simple Storage Service(S3) (Text book 2)

Cloud Security: Cloud security risks, security – a top concern for cloud users, privacy and privacy impact assessment, trust, OS security, Virtual machine security, Security risks

UNIT V

Cloud Application Development: Amazon Web Services : EC2 – instances, connecting clients, security rules, launching, usage of S3 in Java, Cloud based simulation of a Distributed trust algorithm, Cloud service for adaptive data streaming (Text Book 1), Google: Google App Engine, Google Web Toolkit (Text Book 2),

Microsoft: Azure Services Platform, Windows live, Exchange Online, Share Point Services, Microsoft Dynamics CRM (Text Book 2)

Text Books:

- 1) Cloud Computing, Theory and Practice, 1st Edition, Dan C Marinescu, MK Elsevier publisher, 2013
- 2) Cloud Computing, A Practical Approach, 1st Edition, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH, 2017.

Reference books:

- 1) Mastering Cloud Computing, Foundations and Application Programming, 1st Edition, Raj Kumar Buyya, Christen vecctiola, S Tammarai selvi, TMH, 2013.
- 2) Essential of Cloud Computing, 1st Edition, K Chandrasekharan, CRC Press, 2014.
- 3) Cloud Computing, A Hands on Approach, Arshdeep Bahga, Vijay Madiseti, Universities Press, 2014.



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DEPARTMENT OF INFORMATION TECHNOLOGY

IV Year – I Semester	L	T	P	C
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DESIGN PATTERNS				

Course Objectives:

- Demonstration of patterns related to object oriented design.
- Describe the design patterns that are common in software applications
- Analyze a software development problem and express it
- Design a module structure to solve a problem, and evaluate alternatives
- Implement a module so that it executes efficiently and correctly

Course Outcomes:

- Construct a design consisting of a collection of modules
- Examine well-known design patterns (such as Iterator, Observer, Factory and Visitor)
- Distinguish between different categories of design patterns
- Ability to understand and apply common design patterns to incremental/iterative development
- Identify appropriate patterns for design of given problem
- Design the software using Pattern Oriented Architectures

UNIT I

Introduction: Design Pattern, Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

A Case Study: Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation.

UNIT II

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

UNIT III

Structural Pattern: Adapter, Bridge, Composite, Decorator, façade, Flyweight, Proxy.

UNIT IV

Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer.

UNIT V

Behavioral Patterns: State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns.

What to Expect from Design Patterns, a Brief History, the Pattern Community an Invitation, a Parting Thought.



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Text Books:

- 1) “Design Patterns”, Erich Gamma, Pearson Education.

Reference Books:

- 1) “Head First Design patterns”, Eric Freeman & Elisabeth Freeman, O’REILLY, 2007.
- 2) “Design Patterns in Java”, Steven John Metsker & William C. Wake, Pearson education, 2006
- 3) “J2EE Patterns”, Deepak Alur, John Crupi & Dan Malks, Pearson education, 2003.
- 4) “Design Patterns in C#”, Steven John metsker, Pearson education, 2004.
- 5) “Pattern Oriented Software Architecture”, F.Buschmann & others, John Wiley & Sons.

e-Resources:

- 1) <https://www.javatpoint.com/design-patterns-in-java>
- 2) https://www.tutorialspoint.com/design_pattern/design_pattern_overview.htm



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IV Year – I Semester		L	T	P	C
		3	0	0	3
DISTRIBUTED SYSTEMS					

Course Objectives:

- To understand the foundations of distributed systems.
- To learn issues related to clock Synchronization and the need for global state in distributed systems.
- To learn distributed mutual exclusion and deadlock detection algorithms.
- To understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems
- To learn the characteristics of peer-to-peer and distributed shared memory systems

Course Outcomes:

At the end of the course, the students will be able to:

- Enumerate the foundations and issues of distributed systems
- Illustrate the various synchronization issues and global state for distributed systems
- Demonstrate the Mutual Exclusion and Deadlock detection algorithms in distributed systems
- Describe the agreement protocols and fault tolerance mechanisms in distributed systems
- Describe the features of peer-to-peer and distributed shared memory systems

UNIT I

Introduction: Definition, Relation to computer system components, Motivation, Relation to parallel systems, Message-passing systems versus shared memory systems, Primitives for distributed communication, Synchronous versus asynchronous executions, Design issues and challenges.

A model of distributed computations: A distributed program, A model of distributed executions, Models of communication networks, Global state, Cuts, Past and future cones of an event, Models of process communications.

Logical Time: A framework for a system of logical clocks, Scalar time, Vector time, Physical clock synchronization: NTP.

UNIT II

Message ordering and group communication: Message ordering paradigms, Asynchronous execution with synchronous communication, Synchronous program order on an asynchronous system, Group communication, Causal order (CO), Total order. Global state and snapshot recording algorithms: Introduction, System model and definitions, Snapshot algorithms for FIFO channels

UNIT III

Distributed mutual exclusion algorithms: Introduction – Preliminaries – Lamport’s algorithm – Ricart-Agrawala algorithm – Maekawa’s algorithm – Suzuki-Kasami’s broadcast algorithm. Deadlock detection in distributed systems: Introduction – System model – Preliminaries – Models of deadlocks – Knapp’s classification – Algorithms for the single resource model, the AND model and the OR model



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UNIT IV

Check pointing and rollback recovery: Introduction – Background and definitions – Issues in failure recovery – Checkpoint-based recovery – Log-based rollback recovery – Coordinated check pointing algorithm – Algorithm for asynchronous check pointing and recovery. Consensus and agreement algorithms: Problem definition – Overview of results – Agreement in a failure – free system – Agreement in synchronous systems with failures.

UNIT V

Peer-to-peer computing and overlay graphs: Introduction – Data indexing and overlays – Chord – Content addressable networks – Tapestry.

Distributed shared memory: Abstraction and advantages – Memory consistency models – Shared memory Mutual Exclusion

Text Books:

- 1) Distributed Systems Concepts and Design, George Coulouris, Jean Dollimore and Tim Kindberg, Fifth Edition, Pearson Education, 2012.
- 2) Distributed computing: Principles, algorithms, and systems, Ajay D Kshemkalyani and Mukesh Singhal, Cambridge University Press, 2011.

Reference Books:

- 1) Distributed Operating Systems: Concepts and Design, Pradeep K Sinha, Prentice Hall of India, 2007.
- 2) Advanced concepts in operating systems. Mukesh Singhal and Niranjan G. Shivaratri, McGraw-Hill, 1994.
- 3) Distributed Systems: Principles and Paradigms, Tanenbaum A.S., Van Steen M., Pearson Education, 2007.

e-Resources:

- 1) <https://nptel.ac.in/courses/106/106/106106168/>



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DEPARTMENT OF INFORMATION TECHNOLOGY

IV Year – I Semester		L	T	P	C
		3	0	0	3
DevOps					

Course Objectives:

- DevOps improves collaboration and productivity by automating infrastructure and workflows and continuously measuring applications performance

Course Outcomes:

At the end of the course, student will be able to

- Enumerate the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT service agility
- Describe DevOps & DevSecOps methodologies and their key concepts
- Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models
- Set up complete private infrastructure using version control systems and CI/CD tools

UNIT I

Phases of Software Development life cycle. Values and principles of agile software development.

UNIT II

Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system.

UNIT III

DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

UNIT IV

CI/CD: Introduction to Continuous Integration, Continuous Delivery and Deployment, Benefits of CI/CD, Metrics to track CICD practices

UNIT V

Devops Maturity Model: Key factors of DevOps maturity model, stages of Devops maturity model, DevOps maturity Assessment

Text Books:

- 1) The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim , John Willis , Patrick Debois , Jez Humb, 1st Edition, O'Reilly publications, 2016.
- 2) What is Devops? Infrastructure as code, 1st Edition, Mike Loukides ,O'Reilly publications, 2012.



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Reference Books:

- 1) Building a DevOps Culture, 1st Edition, Mandi Walls, O'Reilly publications, 2013.
- 2) The DevOps 2.0 Toolkit: Automating the Continuous Deployment Pipeline With Containerized Microservices, 1st Edition, Viktor Farcic, CreateSpace Independent Publishing Platform publications, 2016
- 3) Continuous Delivery: Reliable Software Releases Through Build, Test, and Deployment Automation, 1st Edition, Jez Humble and David Farley, 2010.
- 4) Achieving DevOps: A Novel About Delivering the Best of Agile, DevOps, and Microservices, 1st Edition, Dave Harrison, Knox Lively, Apress publications, 2019.

e-Resources:

- 1) <https://www.javatpoint.com/devops>
- 2) <https://github.com/nkatre/Free-DevOps-Books-1/blob>



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IV Year – I Semester		L	T	P	C
		3	0	0	3
INTERNET OF THINGS					

Course Objectives:

- Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem
- Formalize a given problem in the language/framework of different AI methods
- Implement basic AI algorithms.
- Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports

Course Outcomes:

- Demonstrate knowledge and understanding of the security and ethical issues of the Internet of Things
- Conceptually identify vulnerabilities, including recent attacks, involving the Internet of Things
- Develop critical thinking skills
- Compare and contrast the threat environment based on industry and/or device type

UNIT I

The Internet of Things: An Overview of Internet of Things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples of IoTs, Design Principles For Connected Devices

UNIT II

Business Models for Business Processes in the Internet of Things, IoT/M2M systems LAYERS AND designs standardizations ,Modified OSI Stack for the IoT/M2M Systems ,ETSI M2M domains and High-level capabilities ,Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability

UNIT III

Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

UNIT IV

Data link layer of IoT, Wireless Communication Technologies, Wired Communication Technologies, Manet Networks: Network Layer of IoT, 6lowPAN adaptation layer for devices with limited resources, Dynamic routing protocols for wireless adhoc networks Communication protocols for IoT, Service oriented protocol(COAP), Communication protocols based on the exchange of messages(MQTT), Service discovery protocols

UNIT V

Data Acquiring, Organizing and Analytics in IoT/M2M, Applications/ Services/ Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems. Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications /Services

Text Books:

- 1) Internet of Things: Architecture, Design Principles And Applications,Rajkamal, McGraw Hill Higher Education.
- 2) Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015.
- 3) Internet of Things from Hype to Reality: The road to Digitization, Ammar Rayes Samersalam.



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Reference Books:

- 1) Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley.
- 2) Getting Started with the Internet of Things Cuno Pfister , Oreilly.
- 3) Internet of Things and Data Analytics Handbook, HWAIYU GENG, Wiley publications.



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DEPARTMENT OF INFORMATION TECHNOLOGY

IV Year – I Semester		L	T	P	C
		3	0	0	3
DATA SCIENCE					

Course Objectives:

From the course the student will learn

- Provide you with the knowledge and expertise to become a proficient data scientist.
- Demonstrate an understanding of statistics and machine learning concepts that are vital for data science
- Learn to statistically analyze a dataset;
- Explain the significance of exploratory data analysis (EDA) in data science.
- Critically evaluate data visualizations based on their design and use for communicating stories from data

Course Outcomes:

At the end of the course, student will be able to

- Describe what Data Science is and the skill sets needed to be a data scientist
- Explain in basic terms what Statistical Inference means. Identify probability distributions commonly used as foundations for statistical modeling. Fit a model to data
- Use R to carry out basic statistical modeling and analysis
- Apply basic tools (plots, graphs, summary statistics) to carry out EDA
- Describe the Data Science Process and how its components interact.
- Use APIs and other tools to scrap the Web and collect data
- Apply EDA and the Data Science process in a case study

UNIT I

Introduction, The Ascendance of Data, Motivating Hypothetical: Data Science, Finding Key Connectors, The Zen of Python, Getting Python, Virtual Environments, Whitespace Formatting, Modules, Functions, Strings, Exceptions, Lists, Tuples, Dictionaries defaultdict, Counters, Sets, Control Flow, Truthiness, Sorting, List Comprehensions, Automated Testing and assert, Object-Oriented Programming, Iterables and Generators, Randomness, Regular Expressions, Functional Programming, zip and Argument Unpacking, args and kwargs, Type Annotations, Type Annotations.

UNIT II

Visualizing Data: matplotlib, Bar Charts, Line Charts, Scatterplots. Linear Algebra: Vectors, Matrices, Statistics: Describing a Single Set of Data, Correlation, Simpson’s Paradox, Some Other Correlational Caveats, Correlation and Causation.

Gradient Descent: The Idea Behind Gradient Descent, Estimating the Gradient, Using the Gradient, Choosing the Right Step Size, Using Gradient Descent to Fit Models, Minibatch and Stochastic Gradient Descent.

UNIT III

Getting Data: stdin and stdout, Reading Files, Scraping the Web, Using APIs,

Working with Data: Exploring Your Data Using NamedTuples

Dataclasses, Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction.



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Probability: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem

UNIT IV

Machine Learning: Modeling, Overfitting and Underfitting, Correctness, The Bias-Variance Tradeoff, Feature Extraction and Selection, k-Nearest Neighbors, Naive Bayes, Simple Linear Regression, Multiple Regression, Digression, Logistic Regression

UNIT V

Support Vector Machines, Decision Trees, Neural Networks: Perceptrons, Feed-Forward Neural Networks, Backpropagation. Clustering: The Idea, The Model, Choosing k, Bottom-Up Hierarchical Clustering.

Recommender Systems: Manual Curation, Recommending What's Popular, User-Based Collaborative Filtering, Item-Based Collaborative Filtering, Matrix Factorization

Data Ethics, Building Bad Data Products, Trading Off Accuracy and Fairness, Collaboration, Interpretability, Recommendations, Biased Data, Data Protection

IPython, Mathematics, NumPy, pandas, scikit-learn, Visualization, R

Text books:

- 1) Joel Grus, "Data Science From Scratch", O'Reilly.
- 2) Allen B.Downey, "Think Stats", O'Reilly.

Reference Books:

- 1) Doing Data Science: Straight Talk From The Frontline, 1st Edition, Cathy O'Neil and Rachel Schutt, O'Reilly, 2013.
- 2) Mining of Massive Datasets, 2nd Edition, Jure Leskovek, Anand Rajaraman and Jeffrey Ullman, v2.1, Cambridge University Press, 2014.
- 3) "The Art of Data Science", 1st Edition, Roger D. Peng and Elizabeth matsui, Lean Publications, 2015
- 4) "Algorithms for Data Science", 1st Edition, Steele, Brian, Chandler, John, Reddy, Swarna, Springer's Publications, 2016.

e-Resources:

- 1) <https://github.com/joelgrus/data-science-from-scratch>
- 2) <https://github.com/donnemartin/data-science-ipython-notebooks>
- 3) <https://github.com/academic/awesome-datascience>



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DEPARTMENT OF INFORMATION TECHNOLOGY

IV Year – I Semester		L	T	P	C
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BIOMETRICS					

Course Objectives:

- Describe the principles of the three core biometric modalities (face, fingerprint and iris), and know how to deploy them in authentication scenarios
- Organize and conduct biometric data collections, and apply biometric databases in system evaluation
- Calculate distributions of within- and between-class matching scores, and calculate various error estimates based on these distributions
- Identify the privacy and security concerns surrounding biometric systems, and know how to address them in such a way that balances both
- Recognize differences between algorithm design and systems engineering in biometrics
- Deploy statistical methods in biometric system evaluation
- Itemize the most up-to-date examples of real biometric applications in human authentication

Course Outcomes:

At the end of the course, student will be able to

- Demonstrate knowledge of the basic physical and biological science and engineering principles underlying biometric systems
- Analyze biometric systems at the component level and be able to analyze and design basic biometric system applications
- Illustrate to work effectively in teams and express their work and ideas orally and in writing
- Identify the sociological and acceptance issues associated with the design and implementation of biometric systems
- Elaborate various Biometric security issues in real world applications

UNIT I

Biometrics- Introduction, benefits of biometrics over traditional authentication systems, benefits of biometrics in identification systems, selecting a biometric for a system, Applications, Key biometric terms and processes, biometric matching methods, Accuracy in biometric systems

UNIT II

Physiological Biometric Technologies- Fingerprints, Technical description, characteristics, Competing technologies, strengths, weaknesses, deployment, Facial scan, Technical description, characteristics, weaknesses, deployment, Iris scan, Technical description, characteristics, strength, weaknesses, deployment

UNIT III

Physiological Biometric Technologies- Hand Biometric: Palm Print, Vein Pattern, Signature and Hand Writing Technology-Technical description, characteristics, strengths, weaknesses and deployment.



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DEPARTMENT OF INFORMATION TECHNOLOGY

UNIT IV

Behavioural Biometric Technologies- Voice Recognition and Key stroke dynamics: Introduction, working, strengths and weaknesses, Voice Recognition Applications, Understanding Voice Recognition, Choice of Features, Speaker modeling, Pattern Matching, Key Stroke Dynamics, Active and Passive Biometrics.

UNIT V

Multi biometrics and multi factor biometrics- two-factor authentication with passwords, tickets and tokens, executive decision, implementation plan, Securing Biometric Template- Cancelable Biometrics, Authentication, Security Analysis.

Text Books:

- 1) A Privacy Enhancing Biometric, Chuck Wilson, Vein pattern recognition, CRC press, 2010
- 2) Biometrics: Identity Verification in a Network, 1st Edition, Samir Nanavathi, Michel Thieme, and Raj Nanavathi, Wiley Eastern, 2002
- 3) Implementing Biometric Security, 1st Edition, John Chirillo and Scott Blaul Wiley Eastern Publication, 2005

Reference Books:

- 1) Security, Risk and the Biometric State: Governing Borders and Bodies, 1st Edition, Benjamin Muller, Routledge, 2010
- 2) Handbook of Biometrics, Jain, Anil K.; Flynn, Patrick; Ross, Arun A. (Eds.), Springer, 2008
- 3) Handbook of Biometrics, Anil K. Jain, Patrick Flynn, Arun A. Ross, Springer, 2007
- 4) Biometrics for Network Security, 1st Edition, John Berger, Prentice Hall, 2004



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DEPARTMENT OF INFORMATION TECHNOLOGY

IV Year – I Semester		L	T	P	C
		0	0	2	1
UNIFIED MODELING LANGUAGE (UML) LAB					

Course Objectives:

- To know the practical issues of the different object oriented analysis and design concepts
- Inculcate the art of object oriented software analysis and design
- Apply forward and reverse engineering of a software system
- Carry out the analysis and design of a system in an object oriented way

Course Outcomes:

At the end of the course, student will be able to

- Know the syntax of different UML diagrams
- Create use case documents that capture requirements for a software system
- Create class diagrams that model both the domain model and design model of a software system
- Create interaction diagrams that model the dynamic aspects of a software system
- Write code that builds a software system
- Develop simple applications

Note: For performing the experiments consider any case study (ATM/ Banking/ Library/Hospital management systems)

Experiment 1:

Familiarization with Rational Rose or Umbrella environment

Experiment 2:

- a) Identify and analyze events
- b) Identify Use cases
- c) Develop event table

Experiment 3:

- a) Identify & analyze domain classes
- b) Represent use cases and a domain class diagram using Rational Rose
- c) Develop CRUD matrix to represent relationships between use cases and problem domain classes

Experiment 4:

- a) Develop Use case diagrams
- b) Develop elaborate Use case descriptions & scenarios
- c) Develop prototypes (without functionality)



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Experiment 5:

- a) Develop system sequence diagrams and high-level sequence diagrams for each use case
- b) Identify MVC classes / objects for each use case
- c) Develop Detailed Sequence Diagrams / Communication diagrams for each use case showing interactions among all the three-layer objects

Experiment 6:

- a) Develop detailed design class model (use GRASP patterns for responsibility assignment)
- b) Develop three-layer package diagrams for each case study

Experiment 7:

- a) Develop Use case Packages
- b) Develop component diagrams
- c) Identify relationships between use cases and represent them
- d) Refine domain class model by showing all the associations among classes

Experiment 8:

- a) Develop sample diagrams for other UML diagrams - state chart diagrams, activity diagrams and deployment diagrams



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IV Year – I Semester		L	T	P	C
		0	0	0	2
Project –I					

Note: The marks are awarded based on: Selection of Area, Defining the problem, Submission of the Abstract and Presentation of seminar.



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IV Year – I Semester		L	T	P	C
		3	0	0	0
IPR & PATENTS					

Course Objectives:

- To know the importance of Intellectual property rights, which plays a vital role in advanced Technical and Scientific disciplines
- Imparting IPR protections and regulations for further advancement, so that the students can familiarize with the latest developments

Course Outcomes:

- IPR Laws and patents pave the way for innovative ideas which are instrumental for inventions to seek Patents
- Student gets an insight on Copyrights, Patents and Software patents which are instrumental for further advancements

UNIT I

Introduction to Intellectual Property Rights (IPR): Concept of Property - Introduction to IPR – International Instruments and IPR - WIPO - TRIPS – WTO -Laws Relating to IPR - IPR Tool Kit - Protection and Regulation - Copyrights and Neighboring Rights – Industrial Property – Patents - Agencies for IPR Registration – Traditional Knowledge –Emerging Areas of IPR - Layout Designs and Integrated Circuits – Use and Misuse of Intellectual Property Rights.

UNIT II

Copyrights and Neighboring Rights: Introduction to Copyrights – Principles of Copyright Protection – Law Relating to Copyrights - Subject Matters of Copyright – Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of Performers – Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Case Law - Semiconductor Chip Protection Act.

UNIT III

Introduction to Patents - Laws Relating to Patents in India – Patent Requirements – Product Patent and Process Patent - Patent Search - Patent Registration and Granting of Patent - Exclusive Rights – Limitations - Ownership and Transfer — Revocation of Patent – Patent Appellate Board - Infringement of Patent – Compulsory Licensing — Patent Cooperation Treaty – New developments in Patents – Software Protection and Computer related Innovations

UNIT IV

Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – Distinction between Trademark and Property Mark – Marks Covered under Trademark Law - Trade Mark Registration – Trade Mark Maintenance – Transfer of rights - Deceptive Similarities Likelihood of Confusion - Dilution of Ownership – Trademarks Claims and Infringement – Remedies – Passing Off Action.



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UNIT V

Introduction to Trade Secrets – General Principles - Laws Relating to Trade Secrets –Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreements Breach of Contract –Law of Unfair Competition – Trade Secret Litigation – Applying State Law. Cyber Law – Information Technology Act 2000 - Protection of Online and Computer Transactions – E-commerce - Data Security – Authentication and Confidentiality - Privacy - Digital Signatures – Certifying Authorities - Cyber Crimes - Prevention and Punishment – Liability of Network Providers.

References:

- 1) Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, New Delhi.
- 2) Deborah E.Bouchoux: Intellectual Property, Cengage Learning, New Delhi.
- 3) Prabhuddha Ganguli: Intellectual Property Rights, Tata Mc-Graw –Hill, New Delhi
- 4) Richard Stim: Intellectual Property, Cengage Learning, New Delhi.
- 5) Kompal Bansal &Parishit Bansal Fundamentals of IPR for Engineers, B. S. Publications (Press).
- 6) Cyber Law - Texts & Cases, South-Western's Special Topics Collections.
- 7) R.Radha Krishnan, S.Balasubramanian: Intellectual Property Rights, Excel Books. New Delhi.
- 8) M.Ashok Kumar and MohdIqbal Ali: Intellectual Property Rights, Serials Pub.



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IV Year – II Semester		L	T	P	C
		3	0	0	3
MANAGEMENT AND ORGANIZATIONAL BEHAVIOR					

Course Objectives:

- To familiarize with the process of management, principles, leadership styles and basic concepts on Organization
- To provide conceptual knowledge on functional management that is on Human resource management and Marketing management
- To provide basic insight into select contemporary management practices and Strategic Management
- To learn theories of motivation and also deals with individual behavior, their personality and perception of individuals
- To understand about organizations groups that affect the climate of an entire organizations which helps employees in stress management

Course Outcomes:

- After completion of the Course the student will acquire the knowledge on management functions, global leadership and organizational structure
- Will familiarize with the concepts of functional management that is HRM and Marketing of new product developments
- The learner is able to think in strategically through contemporary management practices
- The learner can develop positive attitude through personality development and can equip with motivational theories
- The student can attain the group performance and grievance handling in managing the organizational culture

UNIT I

Introduction: Management and organizational concepts of management and organization- Nature and Importance of Management, Functions of Management, System approach to Management - Taylor's Scientific Management Theory, Fayol's Principles of Management, Leadership Styles, Social responsibilities of Management. Designing Organizational Structures: Basic concepts related to Organization - Departmentation and Decentralization, MBO, Process and concepts.

UNIT II

Functional Management: Human Resource Management (HRM) Concepts of HRM, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Wage and Salary Administration Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating. - Marketing Management: Concepts of Marketing, Marketing mix elements and marketing strategies.



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UNIT III

Strategic Management: Strategic Management and Contemporary Strategic Issues: Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and implementation, Generic Strategy alternatives. Bench Marking and Balanced Score Card as Contemporary Business Strategies.

UNIT IV

Individual Behavior: Perception-Perceptual process- Impression management- Personality development – Socialization – Attitude- Process- Formation- Positive attitude- Change – Learning – Learning organizations- Reinforcement Motivation – Process- Motives – Theories of Motivation: Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation,

UNIT V

Group Dynamics: Types of Groups, Stages of Group Development, Group Behaviour and Group Performance Factors, Organizational conflicts: Reasons for Conflicts, Consequences of Conflicts in Organization, Types of Conflicts, Strategies for Managing Conflicts, Organizational Climate and Culture, Stress, Causes and effects, coping strategies of stress.

Text Books:

- 1) Subba Rao P., Organizational Behaviour, Himalaya Publishing House. Mumbai
- 2) L.M. Prasad, Principles and Practice of Management.

Reference Books:

- 1) Fred Luthans Organizational Behaviour, TMH, New Delhi.
- 2) Robins, Stephen P., Fundamentals of Management, Pearson, India.
- 3) Kotler Philip & Keller Kevin Lane: Marketing Mangement 12/e, PHI, 2007
- 4) Koontz & Weihrich: Essentials of Management, 6/e, TMH, 2007
- 5) Kanishka Bedi, Production and Operations Management, Oxford University Press, 2007.



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IV Year – II Semester		L	T	P	C
		3	0	0	3
Open Elective –III Code: OE4201					

Note: The student has to take any one **open elective course** offered in the other departments (or) SWAYAM/NPTEL courses offered by other than parent department. (12 week minimum).

Given below are some of the courses offered by NPTEL/SWAYAM

<p>Electronics & Communication Engineering</p> <ol style="list-style-type: none"> 1) Information Coding Theory 2) VLSI Design 3) Signals & Systems 4) Digital Signal Processing 	<p>Mathematics</p> <ol style="list-style-type: none"> 1) Optimization Techniques 2) Computational Number Theory and Cryptography
<p>Electrical and Electronics Engineering</p> <ol style="list-style-type: none"> 1) Networking Analysis 2) Fuzzy Sets, Logic and Systems & Applications 3) Energy Management Systems and SCADA 4) Industrial Safety Engineering 	<p>Civil Engineering</p> <ol style="list-style-type: none"> 1) Intelligent transportation engineering 2) Remote Sensing and GI 3) Engineering Mechanics 4) City and Metropolitan Planning 5) Sustainable Materials and Green Buildings
<p>Mechanical Engineering</p> <ol style="list-style-type: none"> 1) Industrial Automation and Control 2) Robotics 3) CAD 4) Mechatronics And Manufacturing Automation 5) Non Conventional Energy Resources 	



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IV Year – II Semester		L	T	P	C
		3	0	0	3
DEEP LEARNING					

Course Objectives:

- Demonstrate the major technology trends driving Deep Learning
- Build, train and apply fully connected deep neural networks
- Implement efficient (vectorized) neural networks
- Analyze the key parameters and hyper parameters in a neural network's architecture

Course Outcomes:

- Demonstrate the mathematical foundation of neural network
- Describe the machine learning basics
- Compare the different architectures of deep neural network
- Build a convolutional neural network
- Build and train RNN and LSTMs

UNIT I

Linear Algebra: Scalars, Vectors, Matrices and Tensors, Matrix operations, types of matrices, Norms, Eigen decomposition, Singular Value Decomposition, Principal Components Analysis.

Probability and Information Theory: Random Variables, Probability Distributions, Marginal Probability, Conditional Probability, Expectation, Variance and Covariance, Bayes' Rule, Information Theory. Numerical Computation: Overflow and Underflow, Gradient-Based Optimization, Constrained Optimization, Linear Least Squares.

UNIT II

Machine Learning: Basics and Underfitting, Hyper parameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood, Bayesian Statistics, Supervised and Unsupervised Learning, Stochastic Gradient Descent, Challenges Motivating Deep Learning. Deep Feedforward Networks: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and other Differentiation Algorithms.

UNIT III

Regularization for Deep Learning: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop and Manifold Tangent Classifier. Optimization for Training Deep Models: Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms.

UNIT IV

Convolutional Networks: The Convolution Operation, Pooling, Convolution, Basic Convolution Functions, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised



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Features, Basis for Convolutional Networks.

UNIT V

Sequence Modeling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, Echo State Networks, LSTM, Gated RNNs, Optimization for Long-Term Dependencies, Auto encoders, Deep Generative Models.

Text Books:

- 1) Ian Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2016.
- 2) Josh Patterson and Adam Gibson, “Deep learning: A practitioner's approach”, O'Reilly Media, First Edition, 2017.

Reference Books:

- 1) Fundamentals of Deep Learning, Designing next-generation machine intelligence algorithms, Nikhil Buduma, O'Reilly, Shroff Publishers, 2019.
- 2) Deep learning Cook Book, Practical recipes to get started Quickly, Douwe Osinga, O'Reilly, Shroff Publishers, 2019.

e-Resources:

- 1) <https://keras.io/datasets/>
- 2) <http://deeplearning.net/tutorial/deeplearning.pdf>
- 3) <https://arxiv.org/pdf/1404.7828v4.pdf>
- 4) <https://github.com/lisa-lab/DeepLearningTutorials>



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IV Year – II Semester		L	T	P	C
		3	0	0	3
QUANTUM COMPUTING					

Course Objectives:

- This course teaches the fundamentals of quantum information processing, including quantum computation, quantum cryptography, and quantum information theory

Course Outcomes:

By the end of this course, the student is able to

- Analyze the behaviour of basic quantum algorithms
- Implement simple quantum algorithms and information channels in the quantum circuit model
- Simulate a simple quantum error-correcting code
- Prove basic facts about quantum information channels

UNIT I

Introduction: Quantum Measurements Density Matrices, Positive-Operator Valued Measure, Fragility of quantum information: Decoherence, Quantum Superposition and Entanglement, Quantum Gates and Circuits.

UNIT II

Quantum Basics and Principles: No cloning theorem & Quantum Teleportation, Bell’s inequality and its implications, Quantum Algorithms & Circuits.

UNIT III

Algorithms: Deutsch and Deutsch–Jozsa algorithms, Grover’s Search Algorithm, Quantum Fourier Transform, Shore’s Factorization Algorithm.

UNIT IV

Performance, Security and Scalability: Quantum Error Correction: Fault tolerance; Quantum Cryptography, Implementing Quantum Computing: issues of fidelity; Scalability in quantum computing

UNIT V

Quantum Computing Models: NMR Quantum Computing, Spintronics and QED MODEL, Linear Optical MODEL, Nonlinear Optical Approaches; Limits of all the discussed approaches, Future of Quantum computing.

Textbooks:

- 1) Eric R. Johnston, Nic Harrigan, Mercedes and Gimeno-Segovia “Programming Quantum Computers: Essential Algorithms And Code Samples, SHROFF/ O’Reilly.
- 2) Dr. Christine Corbett Moran, Mastering Quantum Computing with IBM QX: Explore the world of quantum computing using the Quantum Composer and Qiskit, Kindle Edition Packt
- 3) V.K Sahni, Quantum Computing (with CD), TATA McGrawHill.

References:

- 1) Chris Bernhardt, Quantum Computing for Everyone (The MIT Press)
- 2) Michael A. Nielsen and Issac L. Chuang, “Quantum Computation and Information”, Cambridge (2002).



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- 3) Riley Tipton Perry, “Quantum Computing from the Ground Up”, World Scientific Publishing Ltd (2012).
- 4) Scott Aaronson, “Quantum Computing since Democritus”, Cambridge (2013).
- 5) P. Kok, B. Lovett, “Introduction to Optical Quantum Information Processing”, Cambridge.

e-Resources:

- 1) <https://nptel.ac.in/courses/104104082/>
- 2) https://swayam.gov.in/nd1_noc19_cy31/preview



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IV Year – II Semester		L	T	P	C
		3	0	0	3
BLOCKCHAIN TECHNOLOGIES					

Course Objectives:

By the end of the course, students will be able to

- Understand how block chain systems (mainly Bit coin and Ethereum) work and to securely interact with them
- Design, build, and deploy smart contracts and distributed applications
- Integrate ideas from block chain technology into their own projects

Course Outcomes:

At the end of the course, student will be able to

- Demonstrate the foundation of the Block chain technology and understand the processes in payment and funding
- Identify the risks involved in building Block chain applications
- Review of legal implications using smart contracts
- Choose the present landscape of Blockchain implementations and Understand Crypto currency markets
- Examine how to profit from trading crypto currencies

UNIT I

Introduction, Scenarios, Challenges Articulated, Blockchain, Blockchain Characteristics, Opportunities Using Blockchain, History of Blockchain.

Evolution of Blockchain : Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Blockchain Evolution, Consortia, Forks, Public Blockchain Environments, Type of Players in Blockchain Ecosystem, Players in Market.

UNIT II

Blockchain Concepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on blockchain, data storage on blockchain, wallets, coding on blockchain: smart contracts, peer-to-peer network, types of blockchain nodes, risk associated with blockchain solutions, life cycle of blockchain transaction.

UNIT III

Architecting Blockchain solutions: Introduction, Obstacles for Use of Blockchain, Blockchain Relevance Evaluation Framework, Blockchain Solutions Reference Architecture, Types of Blockchain Applications, Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Blockchain Solutions, Architecture Considerations, Architecture with Blockchain Platforms, Approach for Designing Blockchain Applications.

UNIT IV

Ethereum Blockchain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, MyEtherWallet, Ethereum Networks/Environments, Infura, Etherscan, Ethereum Clients, Decentralized Application, Metamask, Tuna Fish Use Case Implementation, OpenZeppelin Contracts



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UNIT V

Hyperledger Blockchain Implementation, Introduction, Use Case – Car Ownership Tracking, Hyperledger Fabric, Hyperledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chaincode Functions Using Client Application.

Advanced Concepts in Blockchain: InterPlanetary File System (IPFS), Zero-Knowledge Proofs, Oracles, Self-Sovereign Identity, Blockchain with IoT and AI/ML Quantum Computing and Blockchain, Initial Coin Offering, Blockchain Cloud Offerings, Blockchain and its Future Potential.

Text Books:

- 1) Ambadas, Arshad Sarfarz Ariff, Sham “Blockchain for Enterprise Application Developers”, Wiley
- 2) Andreas M. Antonopoulos, “Mastering Bitcoin: Programming the Open Blockchain” , O’Reilly

Reference Books:

- 1) Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Bambara, Paul R. Allen, Mc Graw Hill.
- 2) Blockchain: Blueprint for a New Economy, Melanie Swan, O’Reilly

e-Resources:

- 1) <https://github.com/blockchainedindia/resources>



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IV Year – II Semester		L	T	P	C
		3	0	0	3
SOFTWARE PROJECT MANAGEMENT					

Course Objectives:

At the end of the course, the student shall be able to:

- To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
- To compare and differentiate organization structures and project structures
- To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

Course outcomes:

Upon the completion of the course students will be able to:-

- Apply the process to be followed in the software development life-cycle models
- Apply the concepts of project management & planning
- Implement the project plans through managing people, communications and change
- Conduct activities necessary to successfully complete and close the Software projects
- Implement communication, modeling, and construction & deployment practices in software development

UNIT I

Conventional Software Management: The waterfall model, conventional software Management performance.

Evolution of Software Economics: Software Economics, pragmatic software cost estimation.

Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

UNIT II

The Old Way and The New: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

Life Cycle Phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

Artifacts of The Process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT III

Model Based Software Architectures: A Management perspective and technical perspective.

Work Flows of the Process: Software process workflows, Iteration workflows.

Checkpoints of the Process: Major mile stones, Minor Milestones, Periodic status assessments.



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UNIT IV

Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

UNIT V

Process Automation: Automation Building blocks, The Project Environment.

Project Control and Process Instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

Project Estimation and Management: COCOMO model, Critical Path Analysis, PERT technique, Monte Carlo approach (Text book 2)

Text Books:

- 1) Software Project Management, Walker Royce, Pearson Education, 2005.
- 2) Software Project Management, Bob Hughes, 4th edition, Mike Cotterell, TMH.

Reference Books:

- 1) Software Project Management, Joel Henry, Pearson Education
- 2) Software Project Management in practice, Pankaj Jalote, Pearson Education, 2005
- 3) Effective Software Project Management, Robert K. Wysocki, Wiley, 2006



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IV Year – II Semester		L	T	P	C
		3	0	0	3
NETWORK PROGRAMMING					

Course Objectives:

- To understand to Linux utilities
- To understand file handling, signals
- To understand IPC, network programming in Java
- To understand processes to communicate with each other across a Computer Network

Course Outcomes:

The student is able to

- Demonstrate functional layering of network software architectures
- Write your own socket-based network application programs
- Apply software tools for network troubleshooting

UNIT I

Linux Utilities-File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking utilities, Filters, Text processing utilities and Backup utilities. Bourne again shell(bash) – Introduction, pipes and redirection, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples.

Review of C programming concepts-arrays, strings (library functions), pointers, function pointers, structures, unions, libraries in C.

UNIT II

Files-File Concept, File types File System Structure, Inodes, File Attributes, file I/O in C using system calls, kernel support for files, file status information-stat family, file and record locking-lockf and fcntl functions, file permissions- chmod fchmod, file ownership-chown, lchown , fchown, links-soft links and hard links – symlink, link, unlink. File and Directory management – Directory contents, Scanning Directories- Directory file APIs. Process- Process concept, Kernel support for process, process attributes, process control – process creation, replacing a process image, waiting for a process, process termination, zombie process, orphan process.

UNIT III

Signals- Introduction to signals, Signal generation and handling, Kernel support for signals, Signal function, unreliable signals, reliable signals, kill, raise , alarm, pause, abort, sleep functions. Interprocess Communication – Introduction to IPC mechanisms, Pipes- creation, IPC between related processes using unnamed pipes, FIFOs-creation, IPC between unrelated processes using FIFOs(Named pipes), differences between unnamed and named pipes, popen and pclose library functions, Introduction to message queues, semaphores and shared memory. Message Queues- Kernel support for messages, UNIX system V APIs for messages, client/server example. Semaphores-Kernel support for semaphores, UNIX system V APIs for semaphores.



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UNIT IV

Shared Memory- Kernel support for shared memory, UNIX system V APIs for shared memory, client/server example.

Network IPC – Introduction to Unix Sockets, IPC over a network, Client-Server model ,Address formats(Unix domain and Internet domain), Socket system calls for Connection Oriented – Communication, Socket system calls for Connectionless-Communication, Example-Client/Server Programs- Single Server-Client connection, Multiple simultaneous clients, Socket options – setsockopt, getsockopt,fcntl.

UNIT V

Network Programming in Java-Network basics, TCP sockets, UDP sockets (datagram sockets), Server programs that can handle one connection at a time and multiple connections (using multithreaded server), Remote Method Invocation (Java RMI)-Basic RMI Process, Implementation details-Client-Server Application.

Text Books:

- 1) Unix System Programming using C++, T.Chan, PHI.(Units II,III,IV)
- 2) Unix Concepts and Applications, 4th Edition, Sumitabha Das, TMH.(Unit I)
- 3) An Introduction to Network Programming with Java, Jan Graba, Springer, rp 2010.(Unit V)
- 4) Unix Network Programming ,W.R. Stevens, PHI.(Units II,III,IV)
- 5) Java Network Programming,3rd edition, E.R. Harold, SPD, O'Reilly.(Unit V)

Reference Books:

- 1) Linux System Programming, Robert Love, O'Reilly, SPD.
- 2) Advanced Programming in the UNIX environment, 2nd Edition, W.R.Stevens, Pearson Education.
- 3) UNIX for programmers and users, 3rd Edition, Graham Glass, King Ables, Pearson Education.
- 4) Beginning Linux Programming, 4th Edition, N.Matthew, R.Stones, Wrox, Wiley India Edition.
- 5) Unix Network Programming The Sockets Networking API, Vol.-I,W.R.Stevens, Bill Fenner, A.M.Rudoff, Pearson Education.
- 6) Unix Internals, U.Vahalia, Pearson Education.



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DEPARTMENT OF INFORMATION TECHNOLOGY

IV Year – II Semester		L	T	P	C
		0	0	0	7
Project -II					



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Open Electives to be offered by IT for Other Branches:

Open Elective I:

For syllabus Refer to

Data Structures	IT2103
Java Programming	IT2201
Data Base Management Systems	IT2203
C++ Programming	IT2105
Operating Systems	IT2202
Internet of Things	PE4102

Open Elective II:

Problem Solving using Python	ES2101
Web Technologies	IT3202
Machine Learning	IT4102
Distributed Computing	PE4102
AI Tools & Techniques	IT3104
Data Science	PE4102

Open Elective III:

Big Data	PE4101
Image Processing	
Mobile Application Development	
Cyber Security	
Deep Learning	PE4201
Blockchain Technologies	PE4201



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IV Year – II Semester		L	T	P	C
		3	0	0	3
IMAGE PROCESSING Open Elective III					

Course Objectives:

- To become familiar with digital image fundamentals
- To get exposed to simple image enhancement techniques in Spatial and Frequency domain
- To learn concepts of degradation function and restoration techniques
- To study the image segmentation and representation techniques
- To become familiar with image compression and recognition methods

Course Outcomes:

At the end of the course, the students will be able to:

- Know and understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms
- Operate on images using the techniques of smoothing, sharpening and enhancement.
- Use the restoration concepts and filtering techniques
- Illustrate the basics of segmentation, features extraction, compression and recognition methods for color models

UNIT I

Digital Image Fundamentals: Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - Color image fundamentals - RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT.

UNIT II

Image Enhancement: Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.

UNIT III

Image Restoration: Image Restoration - degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering.

UNIT IV

Image Segmentation: Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

UNIT V



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Image Compression and Recognition: Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

Text Books:

- 1) Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Pearson, Third Edition, 2010.
- 2) Anil K. Jain, Fundamentals of Digital Image Processing, Pearson, 2002.

Reference Books:

- 1) Kenneth R. Castleman, Digital Image Processing, Pearson, 2006.
- 2) D.E. Dudgeon and RM. Mersereau, Multidimensional Digital Signal Processing, Prentice Hall Professional Technical Reference, 1990.
- 3) William K. Pratt, Digital Image Processing, John Wiley, New York, 2002.



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IV Year – II Semester		L	T	P	C
		3	0	0	3
MOBILE APPLICATION DEVELOPMENT Open Elective III					

Course Objectives:

- To demonstrate the introduction and characteristics of mobile applications
- Application models of mobile application frameworks. Managing application data and User-interface design for mobile applications
- Integrating networking, the OS and hardware into mobile-applications
- Addressing enterprise requirements in mobile applications – performance, scalability, modifiability, availability and security
- Testing methodologies for mobile applications– Publishing, deployment, maintenance and management. To demonstrate their skills of using Android software development tools
- To demonstrate their ability to deploy software to mobile devices

Course Outcomes:

Upon completion of the course students should be able to:

- Install and configure Android application development tools
- Design and develop user Interfaces for the Android platform
- Save state information across important operating system events
- Apply Java programming concepts to Android application development

UNIT I

Introduction to mobile devices: Introduction to Mobile Computing, Introduction to Android Development Environment, Mobile devices vs. desktop devices, ARM and Intel architectures, Screen resolution, Touch interfaces, Application deployment, App Store, Google Play, Windows Store.

Development environments: XCode, Eclipse, VS2012, PhoneGAP, etc.; Native vs. web applications.

Factors in Developing Mobile Applications: Mobile Software Engineering, Frameworks and Tools, Generic UI Development, Android User.

UNIT II

Android User Interface: Measurements – Device and pixel density independent measuring units User Interface (UI) Components – Editable and non editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities.

UNIT III

Back Ground Running Process, Networking And Telephony Services: Services: Introduction to services – local service, remote service and binding the service, the communication between service and activity, Intent Service.

MultiThreading: Handlers, AsyncTask.

Android network programming: Http Url Connection, Connecting to REST-based and SOAP based Web



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services.

Broad cast receivers: Local Broadcast Manager, Dynamic broadcast receiver, System Broadcast.
Pending Intent, Notifications.

UNIT IV

Android: Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications.

UNIT V

Advanced Topics: Power Management: Wake locks and assertions, Low-level OS support, Writing power-smart applications.

Augmented Reality via GPS and other sensors: GPS, Accelerometer, Camera.

Mobile device security in depth: Mobile malware, Device protections, iOS “Jailbreaking”, Android “rooting” and Windows’ “defenestration”; Security and Hacking: Active Transactions, More on Security, Hacking Android.

Text Books:

- 1) Bill Phillips, Chris Stewart, Brian Hardy, and Kristin Marsicano, Android Programming: The Big Nerd
- 2) Ranch Guide, Big Nerd Ranch LLC, 2nd edition, 2015.
- 3) Valentino Lee, Heather Schneider, and Robbie Schell, Mobile Applications: Architecture, Design and Development, Prentice Hall, 2004.
- 4) Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox) , 2012
- 5) Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013
- 6) Dawn Griffiths, David Griffiths, “*Head First: Android Development*” ,OReilly2015,ISBN: 9781449362188
- 7) <http://developer.android.com/develop/index.html>
- 8) Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012

Reference Books:

- 1) Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013
- 2) Tomasz Nurkiewicz and Ben Christensen, Reactive Programming with RxJava, O’Reilly Media, 2016.
- 3) Brian Fling, Mobile Design and Development, O’Reilly Media, Inc., 2009.
- 4) Maximiliano Firtman, Programming the Mobile Web, O’Reilly Media, Inc., 2nd ed., 2013.
- 5) Cristian Crumlish and Erin Malone, Designing Social Interfaces, 2nd ed., O’Reilly Media, Inc., 2014.
- 6) Suzanne Ginsburg, Designing the iPhone User Experience: A User-Centered Approach to Sketching and Prototyping iPhone Apps, Addison-Wesley Professional, 2010.



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IV Year – II Semester		L	T	P	C
		3	0	0	3
CYBER SECURITY Open Elective III					

Course Objectives:

In this course, the student will learn about

- The essential building blocks and basic concepts around cyber security
- Types of malware
- Types of Threats & Risks

Course Outcomes:

At the end of the course, the students will be able to:

- Illustrate the broad set of technical, social & political aspects of Cyber Security and security management methods to maintain security protection
- Appreciate the vulnerabilities and threats posed by criminals, terrorist and nation states to national infrastructure
- Illustrate the nature of secure software development and operating systems
- Demonstrate the role security management plays in cyber security defense and legal and social issues at play in developing solutions.

UNIT I

Introduction: Introduction to Computer Security, Threats, Harm, Vulnerabilities, Controls, Authentication, Access Control, and Cryptography, Authentication, Access Control, Cryptography.
 Programs and Programming: Unintentional (Non-malicious) Programming Oversights, Malicious Code—Malware, Countermeasures.

UNIT II

Web Security: User Side, Browser Attacks, Web Attacks Targeting Users, Obtaining User or Website Data, Email Attacks.
 Operating Systems Security: Security in Operating Systems, Security in the Design of Operating Systems, Rootkit.

UNIT III

Network Security: Network Concepts, Threats to Network Communications, Wireless Network Security, Denial of Service, Distributed Denial-of-Service Strategic Defenses: Security Countermeasures, Cryptography in Network Security, Firewalls, Intrusion Detection and Prevention Systems, Network Management .
 Cloud Computing and Security: Cloud Computing Concepts, Moving to the Cloud, Cloud Security Tools and Techniques, Cloud Identity Management, Securing IaaS.



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UNIT IV

Privacy: Privacy Concepts, Privacy Principles and Policies, Authentication and Privacy, Data Mining, Privacy on the Web, Email Security, Privacy Impacts of Emerging Technologies, Where the Field Is Headed.

Management and Incidents: Security Planning, Business Continuity Planning, Handling Incidents, Risk Analysis, Dealing with Disaster.

UNIT V

Legal Issues and Ethics: Protecting Programs and Data, Information and the Law, Rights of Employees and Employers, Redress for Software Failures, Computer Crime, Ethical Issues in Computer Security, Incident Analysis with Ethics Emerging Topics: The Internet of Things, Economics, Computerized Elections, Cyber Warfare.

Text Books:

- 1) Pfleeger, C.P., Security in Computing, Prentice Hall, 2010, 5th edition.
- 2) Schneier, Bruce. Applied Cryptography, Second Edition, John Wiley & Sons, 1996

Reference Books:

- 1) Rhodes-Ousley, Mark. Information Security: The Complete Reference, Second Edition, Information Security Management: Concepts and Practice, McGraw-Hill, 2013.
- 2) Whitman, Michael E. and Herbert J. Mattord. Roadmap to Information Security for IT and Infosec Managers. Boston, MA: Course Technology, 2011.