# 2024 (MR24)

# MASTER OF COMPUTER APPLICATIONS (MCA)

# CURRICULUM

## MCA Regular

**(Applicable for the batches admitted from 2024-25)**

# MALINENI LAKSHMAIAH WOMEN'S ENGINEERING COLLEGE

## (AUTONOMOUS)

(Accredited by "NBA" & "NAAC" with A+ Grade | Approved by AICTE, New Delhi & Affiliated to JNTUK, Kakinada)

Pulladigunta(Vil), Vatticherukuru (Md), Prathipadu Road, Guntur - 522 017

Andhra Pradesh. www. mlewguntur.com

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# ACADEMIC REGULATIONS (MR24)

For

## Master of Computer Applications (MCA) Programme

### (Duration: Two Years)

(Applicable for the batches admitted from the **A.Y. 2024-25**)

# ACADEMIC REGULATIONS

Applicable for the students of Master of Computer Applications (MCA) PG Programme admitted from the Academic Year 2024-25 onwards. The MCA Degree of Jawaharlal Nehru Technological University Kakinada shall be conferred on candidates who are admitted to the program and who fulfil all the requirements for the award of the Degree.

## 1.0 ELIGIBILITY FOR ADMISSIONS

Admission to the above program shall be made subject to eligibility, qualification and specialization as prescribed by the University from time to time.

Admissions shall be made on the basis of merit rank obtained by the candidates at ICET examination or the qualifying Entrance Test conducted by the University or on the basis of any other order of merit as approved by the University, subject to reservations as laid down by the Govt. from time to time.

## 2.0 AWARD OF MCA DEGREE

2.1 A student shall be declared eligible for the award of the MCA Degree, if he pursues a course of study and completes it successfully in not less than two academic years and not more than Four academic years.

2.2 The student shall register for all 80 credits and secure all the 80 credits.

2.3 The minimum instruction days in each semester are 90.

2.4 A Student, who fails to fulfill all the academic requirements for the award of the degree within Four academic years from the year of their admission, shall forfeit his seat in MCA course.

2.5 Credit Definition:

| | |
|---|---|
| 1 Hour Lecture (L) per week | 1 Credit |
| 1 Hour Tutorial (T) per week | 1 Credit |
| 1 Hour Practical (P) per week | 0.5 Credit |

## 3.0 ATTENDANCE

3.1 A candidate shall be deemed to have eligibility to write end semester examinations if he has put in a minimum of 75% of attendance in aggregate of all the subjects.

3.2 A student is eligible to write the University examinations if he acquires a minimum of 40% in each subject and 75% of attendance in aggregate of all the subjects.

3.3 Condonation of shortage of attendance up to 10% i.e., 65% and above, and below 75% may be given for a **maximum of TWO times** by the college academic committee.

3.4 Condonation of shortage of attendance shall be granted only on genuine and valid reasons on representations by the candidate with supporting evidence.

3.5 Shortage of attendance below 65 % in aggregate shall not **be condoned and not eligible to write their end semester examination of that class.**

3.6 A candidate shall not be promoted to the next semester unless; he/she fulfills the attendance requirements of the previous semester.

3.7 A stipulated fee of Rs 500/- shall be payable towards condonation fee for shortage of attendance. Students availing condonation on medical ground shall produce a medical certificate issued by the competitive authority.

3.8 A student shall not be promoted to the next semester unless he satisfies the attendance requirement of the present semester, as applicable. They may seek readmission into that semester when offered next. If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

## 4.0 EVALUATION

The performance of the candidate in each semester shall be evaluated subject-wise, with a maximum of 100 marks both for theory and practicals on the basis of continues Internal Exams and End Semester Examination.

4.1 **Continuous Internal Evaluation:**

**Theory**

(a) For theory subjects, during a semester, there shall be two mid-term examinations. Each midterm examination shall be conducted for a total duration of 120 minutes with 4 questions (without choice) each question for 10 marks.

(b) The descriptive examination is set with 4 full questions from first two and half units (50% of the syllabus), the student has to answer all questions. In the similar lines, descriptive examination shall be conducted on the rest of the syllabus.

(c) The first mid (Mid-1) marks shall be submitted to the University examination section within one week after completion of first mid examination.

(d) The mid marks submitted to the University examination section shall be displayed in the concerned college notice boards for the benefit of the students.

(e) If any discrepancy found in the submitted Mid-1 marks, it shall be brought to the notice of university examination section within one week from the submission.

(f) Second mid examination shall be conducted on the similar lines of mid-1 and its mid (Mid-2) marks shall also be submitted to University examination section within one week after completion of second mid examination and it shall be displayed in the notice boards. If any discrepancy found in the submitted mid-2 marks, it shall be brought to the notice of university examination section within one week from the submission.

(g) The final marks are the sum of average of two mid-term examinations i.e.

$$\frac{M + M}{2}$$

(h) With the above criteria, university examination section will send mid marks of all subjects in consolidated form to all the concerned colleges and same shall be displayed in the concerned college notice boards. If any discrepancy found, it shall be brought to the notice of university examination section through proper channel within one week with all proofs. Discrepancies brought after the given deadline will not be entertained under any circumstances.

4.2 **End Semester Theory Examination Evaluation:**

**Theory:**

The end semester examinations shall be conducted by the university examination section for 60 marks consists of five questions carrying 12 marks each. Each of these questions may contain sub-questions. For each question there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

4.3 **Laboratory Evaluation:**

**Internal Evaluation:** The internal marks for laboratory are 40 marks and the marks shall be awarded based on the day to day work: 10 marks, Record: 5 marks and the remaining 25 marks to be awarded by conducting an internal laboratory test.

**External Evaluation:** For external marks for laboratory are 60 and marks shall be awarded based on the performance in the end laboratory examinations. Laboratory examination must be conducted with two Examiners, one of them being the Laboratory Class Teacher and the second examiner shall be appointed by the university from the panel of examiners submitted by the respective college. Laboratory examination must be conducted with a breakup marks of Procedure-15, Experimentation-25, Results-10, Viva-voce-10.

4.4 There shall be an internship / industry oriented mini project/ skill development course, one need to complete during year break (*i.e., II-Sem to III-Sem*) and will be evaluated for 50 marks internally at the end of III Semester by the departmental committee. For skill development course the certificate has to be verified and submitted to the University. A candidate has to secure a minimum 50% of marks to be declared successful.

4.5 For Bridge course, the course shall be taken on MOOCS platform, the candidate has to get a satisfactory report upon successful completion, and the same shall be communicated to the University as Completed or Not Completed.

4.6 A candidate shall be deemed to have secured the minimum academic requirement in a subject if he secures a minimum of 40% of marks in the End Semester Examination and a minimum aggregate of 50% of the total marks in the End Semester Examination and Internal Evaluation taken together.

4.7 In case the candidate does not secure the minimum academic requirement in any subject (as specified in 4.6) he has to reappear for the End Semester Examination in that subject. A candidate shall be given one chance to re-register for each subject provided the internal marks secured by a candidate are less than 50% and has failed in the end examination. In such a case, the candidate must re-register for the subject(s) and secure the required minimum attendance. The candidate's attendance in the re-registered subject(s) shall be calculated separately to decide upon his eligibility for writing the end examination in those subject(s). In the event of the student taking another chance, his internal marks and end examination marks obtained in the previous attempt are nullified. For re-registration the candidates have to apply to the University through the college by paying the requisite fees and get approval from the University before the start of the semester in which re-registration is required. At a given time, a candidate is permitted to re-register for maximum of two subjects in addition to the subjects of regular semester, when the student is on roles. Once the completion of the course work, a student can re-register a maximum of SIX Courses at any time"

4.8 In case the candidate secures less than the required attendance in any re registered subject (s), he/she shall not be permitted to write the End Semester Examination in that subject. He shall again re-register the subject when next offered.

4.9 Laboratory examination for MCA courses must be conducted with two Examiners, one of them being the Laboratory Class Teacher or teacher of the respective college and the second examiner shall be appointed by the university from the panel of examiners submitted by the respective college.

4.10 A candidate shall be allowed to submit the project report only after fulfilling the attendance requirements of all the semesters. The viva-voce examination shall be conducted at the end of the course work (4thsemester).

## 5.0 EVALUATION OF PROJECT/DISSERTATION WORK

Every candidate shall be required to submit a thesis or dissertation on a topic approved by the Project Review Committee.

5.1 A Project Review Committee (PRC) shall be constituted with Head of the Department and two other senior faculty members (one will be the guide).

5.2 Registration of Project Work: A candidate is permitted to register for the project work after satisfying the attendance requirement of all the subjects, both theory and practical up to III semester.

5.3 After satisfying 5.2, a candidate has to submit, in consultation with his project supervisor, the title, objective and plan of action of his project work to the Project Review Committee for approval. The student can initiate the Project work, only after obtaining the approval from the Project Review Committee (PRC) after the III semester end examinations. The duration of the project is for one semester.

5.4 If a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the Project Review Committee (PRC). However, the Project Review Committee (PRC) shall examine whether or not the change of topic/supervisor leads to a major change of his initial plans of project proposal. If yes, his date of registration for the project work starts from the date of change of Supervisor or topic as the case may be.

5.5 A candidate shall submit his status report in two stages at least with a gap of ONE month between them.

5.6 The work on the project shall be initiated at the beginning of the Sixth semester and the duration of the project is one semester. A candidate is permitted to submit Project Thesis only after the approval of PRC not earlier than 20 weeks

from the date of registration of the project work. The candidate has to pass all the theory and practical subjects before submission of the Thesis. For the approval of PRC the candidate shall submit the draft copy of thesis to the Principal (through Head of the Department) and shall make an oral presentation before the PRC.

5.7 Three copies of the Project Thesis certified by the supervisor shall be submitted to the College along with **plagiarism report (<50%)**.

5.8 The thesis shall be adjudicated by one examiner selected by the University. For this, the Principal of the College shall submit a panel of 5 examiners, eminent in that field, with the help of the guide concerned and head of the department.

5.9 If the report of the examiner is not favorable, the candidate shall revise and resubmit the Thesis, in the time frame as decided by the PRC. If the report of the examiner is unfavorable again, the thesis shall be summarily rejected. The candidate has to re-register for the project and complete the project within the stipulated time after taking the approval from the University.

5.10 If the report of the examiner is favorable, a board consisting of the Supervisor, Head of the Department and the examiner approved by the University who adjudicated the thesis shall conduct Viva-Voce examination. The Board shall jointly report the candidate's work for a **maximum of 100 Marks**. The Head of the Department shall coordinate and make arrangements for the conduct of Viva-Voce examination.

5.11 If the report of the Viva-Voce is **unsatisfactory (i.e., <50 marks)**, the candidate shall retake the Viva-Voce examination only after three months. If he fails to get a satisfactory report at the second Viva-Voce examination, the candidate has to re-register for the project and complete the project within the stipulated time after taking the approval from the Institution.

## 6.0 Cumulative Grade Point Average (CGPA)

| Marks Range (Max –100) | Level | Letter Grade | Grade Point |
|---|---|---|---|
| ≥ 90 | Outstanding | A+ | 10 |
| ≥80 to <90 | Excellent | A | 9 |
| ≥70 to <80 | Very Good | B | 8 |
| ≥60 to <70 | Good | C | 7 |
| ≥50 to <60 | Satisfactory | D | 6 |
| <50 | Fail | F | 0 |
| - | Absent | AB | 0 |

**Computation of SGPA**

The following procedure is to be adopted to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

The **SGPA** is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

$$\text{SGPA (S}_i) = \Sigma (C_i \times G_i) / \Sigma C_i$$

Where $C_i$ is the number of credits of the ith course and $G_i$ is the grade point scored by the student in the ith course.

**Computation of CGPA**

The **CGPA** is also calculated in the same manner taking into account all the courses undergone by a student over all the semester of a programme, i.e.,

$$\text{CGPA} = \Sigma (C_i \times S_i) / \Sigma C_i$$

Where $S_i$ is the SGPA of the it semester and $C_i$ is the total number of credits in that semester. The SGPA and CGPA shall be rounded off to TWO decimal points and reported in the transcripts.

## 7.0 AWARD OF DEGREE AND CLASS

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of M.C.A. Degree he shall be placed in one of the following four classes:

| Class Awarded | CGPA to be secured | |
|---|---|---|
| First Class with Distinction | ≥ 7.75 (Without any supplementary appearance) | **From the CGPA secured from 80 Credits.** |
| First Class | ≥ 7.75 (With any supplementary appearance)  ≥ 6.75 to < 7.75 | |
| Second Class | ≥ 6.0 to < 6.75 | |
| Pass Class | < 6.0 | |

The secured grade, grade points, status and credits obtained will be shown separately in the memorandum of marks.

## 8.0   WITHHOLDING OF RESULTS

If the student is involved in indiscipline/malpractices/court cases, the result of the student will be withheld.

## 9.0   TRANSITORY REGULATIONS

9.1   Discontinued or detained candidates are eligible for readmission (within the duration as mentioned in item 2.1) as and when next offered.

9.2   The readmitted students will be governed by the regulations under which the candidate has been admitted.

## 10.0 Minimum Instruction Days

The minimum instruction days for each semester shall be 90 working days. There shall be no transfer from one college to another within the Constituent Colleges and Units of Jawaharlal Nehru Technological University Kakinada.

## 11.0 GENERAL

11.1 Wherever the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".

11.2 The academic regulation should be read as a whole for the purpose of any interpretation.

11.3 In the case of any doubt or ambiguity in the interpretation of the above rules/ regulations, the decision of the Vice-Chancellor is final.

11.4 The University may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the University.

**\* \* \***

# MALPRACTICES RULES

## DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

| | Nature of Malpractices/Improper conduct | Punishment |
|---|---|---|
| | *If the candidate:* | |
| 1. (a) | Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination) | Expulsion from the examination hall and cancellation of the performance in that subject only. |
| (b) | Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter. | Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him. |
| 2. | Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing. | Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. |
| 3. | Impersonates any other candidate in connection with the examination. | The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all External examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an |

| | | outsider, he will be handed over to the police and a case is registered against him. |
|---|---|---|
| 4. | Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination. | Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all External examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. |
| 5. | Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks. | Cancellation of the performance in that subject. |
| 6. | Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination. | In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them. |
| 7. | Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall. | Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical |

| | | examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all External examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. |
|---|---|---|
| 8. | Possess any lethal weapon or firearm in the examination hall. | Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. |
| 9. | If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8. | Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them. |
| 10. | Comes in a drunken condition to the examination hall. | Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. |
| 11. | Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny. | Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations. |
| 12. | If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment. | |

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# COURSE STRUCTURE & SYLLABUS

# MASTER OF COMPUTER APPLICATIONS (MCA)

(For **Two-Year** PG Programme)

*(Applicable for batches admitted from 2024-25)*

# COURSE STRUCTURE

**I Semester**

| S.No | Course Code | Course Name | Category | L | T | P | Credits |
|------|-------------|-------------|----------|---|---|---|---------|
| 1 | 24MCA1T01 | Data Structures | PC | 3 | 0 | 0 | 3 |
| 2 | 24MCA1T02 | Computer Organization | PC | 3 | 0 | 0 | 3 |
| 3 | 24MCA1T03 | Database Management Systems | PC | 3 | 0 | 0 | 3 |
| 4 | 24MCA1T04 | Operating Systems | PC | 3 | 0 | 0 | 3 |
| 5 | 24MCA1T05 | Mathematical and Statistical Foundations | BS&H | 3 | 1 | 0 | 4 |
| 6 | 24MCA1L03 | Database Management Systems Lab | PC | 0 | 0 | 3 | 1.5 |
| 7 | 24MCA1L01 | Data Structures using C Lab | PC | 0 | 0 | 4 | 2 |
| 8 | 24MCA1L04 | Operating Systems and Linux Lab | PC | 0 | 0 | 3 | 1.5 |
| | | | **Total** | **15** | **1** | **10** | **21** |

**II Semester**

| S.No | Course Code | Course Name | Category | L | T | P | Credits |
|------|-------------|-------------|----------|---|---|---|---------|
| 1 | 24MCA2T01 | Computer Networks | PC | 3 | 0 | 0 | 3 |
| 2 | 24MCA2T02 | Network Security and Cyber Security | PC | 3 | 0 | 0 | 3 |
| 3 | 24MCA2T03 | Object Oriented Programming Using JAVA | PC | 3 | 0 | 0 | 3 |
| 4 | 24MCA2T04 | Software Engineering | PC | 3 | 0 | 0 | 3 |
| 5 | 24MCA2T05 | Artificial Intelligence | PC | 3 | 0 | 0 | 3 |
| 6 | 24MCA2PE01 24MCA2PE02 24MCA2PE03 24MCA2PE04 | **Program Elective-1** 1. Design and Analysis of Algorithms 2. Advanced Unix Programming 3. Data Warehousing and Data mining 4. MOOCS-1(NPTEL/SWAYAM) (Recommended 12 weekcourse with 3 credits) | PC/ PE | 3 | 0 | 0 | 3 |
| 7 | 24MCA2L03 | Object Oriented Programming Using JAVA Lab | PC | 0 | 0 | 3 | 1.5 |
| 8 | 24MCA2L02 | Networks and Security Lab | PC | 0 | 0 | 3 | 1.5 |
| 9 | 24MCA2AC1 | Employability Skills-1$ | AC | 1 | 0 | 0 | 0 |
| | | | **Total** | **19** | **0** | **6** | **21** |

∫ This may be conducted in Zero Hour.

$ Internal Evaluation

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**MCA I Semester**

# DATA STRUCTURES (24MCA1T01)

## Course Objectives:

- The objective of this course is to explore basic data structures such as stacks and queues, introduce a variety of data structures such as hash tables, search trees, tries,heaps, graphs, sorting and pattern matching algorithms

## UNIT-I:

**Introduction to C:** Constants and variables, Operators and Expressions, Managing Input and Output operators, Decision making-branching and looping, Arrays

## UNIT-II:

Functions, Structures and Unions, Pointers, File handling in C.

## UNIT–III:

**Data structure:** Definition, types of data structures Recursion Definition, Design Methodology and Implementation of recursive algorithms, Linear and binary recursion. Preliminaries of algorithms, analysis and complexity. Linear list–singly linked list, Double linked list and circular linked list -implementation, insertion, deletion and searching operations on linear list.

## UNIT-IV:

**Stacks**-Operations, array and linked representations of stacks, stack applications, **Queues**-operations, array and linked representations. **Hash Table Representation:** hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing and rehashing, extendible hashing.

## UNIT-V:

**Sorting Techniques:** Insertion sort, selection sort, exchange-bubble sort, quick sort and merge sort Algorithms. **Trees:** Binary Trees, terminology, representation and traversals- pre, posts in order traversals. **Search Trees:** Binary Search Trees, Definition, Implementation, Operations-Searching, Insertion and Deletion, AVL Trees, Red-Black Trees

### Text Books:

1. Programming in ANSI C,5e, E. Balagurusamy, TMH

2. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.

3. Data Structures using C - A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

### Reference Books:

1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R.F. Gilberg and B. A. Forouzan, Cengage Learning.

### Web Resources:

1. https://archive.nptel.ac.in/courses/106/102/106102064/

2. https://ocw.mit.edu/courses/6-006-introduction-to-algorithms-spring-2020/video_galleries/lecture-videos/

3. https://www.cs.usfca.edu/~galles/visualization/Algorithms.html

4. https://visualgo.net/en

5. https://elearn.daffodilvarsity.edu.bd/course/view.php?id=11771

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**MCA I Semester**

# COMPUTER ORGANIZATION (24MCA1T02)

**Course Objectives:**

**The objectives of this course are to**

- Conceptualize the basics of organizational and architectural issues of a digital computer.
- Learn the function of each element of a memory hierarchy.
- Study various data transfer techniques in digital computers.

## UNIT I:

**Basic Structure Of Computers: Computer:** Types, Functional units, Basic Operational concepts, Bus structures, Software, Performance, multiprocessor and multi computers, Historical perspective.

## UNIT II:

**Machine Instructions and Programs:** Numbers, Arithmetic Operations, and Characters, Memory locations and addresses, Memory operations, Instructions and Instruction sequencing, Addressing Modes, Assembly Languages, stacks and Queues Basic Input/output Operations, role of Stacks and Queues Additional Instructions

## UNIT III:

**Input/ Output Organization:** Accessing I/O Devices, Interrupts, Processor examples, Direct Memory Access, Buses, Interface Circuits, and Standard I/O Interfaces

## UNIT IV:

**The Memory Systems:** Some Basic concepts, Semiconductor RAM memories, Memory System Consideration, Read-Only Memories**,** Speed, Size, and cost, Cache Memories, Performance considerations, Virtual Memories, Memory Management Requirements, Secondary Storage

## UNIT IV:

**Parallel Processing:** Basic concepts, Pipeline Processors, Multiprocessors

### Text Books:

1. Computer Organization, Carl Hamacher, ZvonksVranesic, Safea Zaky,5th Edition, McGraw Hill.

2. Computer Architecture and Organization, John P. Hayes,3rdEdition, McGrawHill

### Reference Books:

1. Computer Organization and Architecture, William Stallings Sixth Edition, Pearson/PHI

2. Structured Computer Organization, Andrew S. Tanenbaum, 4th Edition PHI/Pearson

3. Fundamentals of Computer Organization and Design, Siva Rama DandamudiSpringer Int. Edition.

### Web Resources:

1. https://nptelvideos.com/course.php?id=396

2. https://onlinecourses.nptel.ac.in/noc20_cs64/preview

3. https://www.learncomputerscienceonline.com/computer-organization-and-architecture/

4. http://williamstallings.com/COA/COA8e-student/index.html

**MCA I Semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

# DATABASE MANAGEMENT SYSTEMS (24MCA1T03)

## Course Objectives:

This Course will enable students to

- Explain the concept of data bases, database management systems, database structures and how they work.

- Make use of Entity-Relationship Modeling and Relational Modeling for creating simple databases from the real world scenarios.

- Write relational algebra and structured query language(SQL)statements.

- Normalize a database using Normalization Rules.

- Discuss the issues associated with Transaction Management and Recovery, Tree Structured and Hash-Based Indexing

## UNIT-I:

**Overview of Database System:** Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database Users and Administrators, History of Database Systems. [Text Book -2]

**Introduction to Database Design:** Database Design and ER Diagrams, Entities, Attributes and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model, Extended ER features [Text Book -1]

## UNIT-II:

**Relational Model:** Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity Constraints, Querying Relational Data, Logical Database Design: ER to Relational, Introduction to Views, Destroying/Altering Tables and Views [Text Book -1]

**Relational Algebra:** Selection and Projection, Set Operations, Renaming, Joins, Division, More Examples of Algebra Queries, **Relational Calculus:** Tuple Relational Calculus, Domain Relational Calculus [Text Book -1]

## UNIT-III:

**SQL: Queries, Constraints, Triggers:** The Form of a Basic SQL Query, UNION,

INTERSECT and EXCEPT, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers, Exceptions, Procedures, Functions [Text Book -1]

**Normal Forms:** Introduction to Schema Refinement, Functional Dependencies, Reasoning about FDs, Normal Forms, Properties of Decompositions, Normalization. [Text Book -1]

## UNIT- IV:

**Schema Refinement:** Multivalued dependencies, Fourth Normal form, Join Dependencies, Fifth Normal Form, Lossless join, dependency preservation. [Text Book -1]

**Transaction Management:** Transaction Concepts, Transaction state, Implementation of Atomicity and Durability, Concurrent Execution, Serializability, Recoverability. [Text Book - 2] **Concurrency Control**: Lock-based Protocols: Locks, Granting of Locks, Two Phase Locking Protocol, Implementation of locking; Timestamp-Based Protocols: Time Stamps, Time Stamp Ordering protocol, Thomas Write Rule, Validation-Based Protocols [Text Book - 2]

## UNIT-V:

**Overview of Storage and Indexing:** Data on External Storage, File organization and indexing: Clustered Indexes, Primary and Secondary Indexes; Index Data Structures: Hash and Tree based indexing; Comparison of File organizations. [Text Book -1] **Tree Structured Indexing**: Intuitions for Tree Indexes, Indexed Sequential Access Method (ISAM), B+ Trees: A Dynamic Index Structure, Search, Insert, Delete, Duplicates, B+ Trees in Practice [Text Book -1]

### *Text Books:*

1. Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, McGraw-Hill

2. Database System Concepts, 6/e, Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill

3. DatabaseSystems,9/e, Carlos Coronel, Steven Morris, PeterRob, Cengage

### *Reference Books:*

1. Introduction to Database Systems,8/e, CJ Date, Pearson

2. Database Systems,6/e Ramez Elmasri, Shamkant B.Navathe, Pearson

### *Web Resources:*

1. https://nptel.ac.in/courses/106105175

2. https://onlinecourses.swayam2.ac.in/cec22_cs18/preview

3. https://cs186berkeley.net/

4. https://www.youtube.com/playlist?list=PL52484DF04A264E59

5. https://courses.cs.washington.edu/courses/cse414/17au/calendar/lecturelist.html

6. https://www.db-book.com/slides-dir/index.html

**MCA I Semester**

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# OPERATING SYSTEMS (24MCA1T04)

**Course Objectives:**

This course enables the student to

- Introduce different types of operating systems.

- Learn process management techniques.

- Learn various memory management techniques.

- Introducing the architecture of the Linux operating system.

- Learn multiple operating systems like Unix and Windows.

## UNIT–I:

**Introduction to Operating System Concept:** Types of Operating Systems, Operating Systems Concepts, Operating System Operations. Operating Systems Structures- Operating System Services, User Operating-System Interface, Introduction to System calls, Types of System Calls.

## UNIT–II:

**Process Management:** Process concept, Process State Diagram, Process control block, Process Scheduling, Inter process Communication, Threads-Threading Issues, Scheduling -Basic Concepts, Scheduling Criteria, Scheduling Algorithms.

## UNIT-III:

**Process Synchronization**: The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors, **Principles of deadlock:** System Model, Deadlock characterization, Deadlock handling, Deadlock Prevention, Detection and Avoidance, Recovery Starvation, Critical Regions form Deadlock

## UNIT–IV:

**Memory Management:** Swapping, Contiguous Memory Allocation, Paging, structure of the Page Table, Segmentation Virtual Memory Management- Demand Paging, Page-Replacement Algorithms, Thrashing. **File-System Interface:** File Concept, Access

Methods, Directory structure, File-System mounting, Files Sharing, Protection. File- System implementation- File-System Structure, Allocation Methods, Free-Space Management, Disk Structure, Disk Scheduling

## UNIT-V:

**Case Studies: Linux System:** Design Principles, kernel Modules, Process Management, File Systems, Input and Output, Interprocess Communication, Network Structure, Security. **Windows 7:** Design Principles, System Components, Terminal Services and Fast User, File System, Networking, Programmer Interface.

## Text Books:

1. Operating System concepts, Abraham Siliberschatz, Peter Baer Galvin, GregGagne, John Wiley & Sons,Inc., Edition 9,2011

2. Introduction to UNIX and  Shell  Programming, M.G. VenkateshMurhty, Pearson, 2005

3. UNIX & Shell Programming, B.M. Harwani, OXFORD University Press,2013

## Reference Books:

1. Advanced Programming in the UNIX Environment, W. Richard Stevens, Stephen Rago, Wesley Professional, 2013

2. UNIX Network Programming, W. Richard Stevens,1990

3. Operating Systems, William stallings, PHI/Pearson,6/E,2009

4. Operating Systems, Dietal, Dietal, Pearson,3/e,2007

5. Operating Systems, Dhamdhere, TMH,2/e,2009

## Web References:

1. https://onlinecourses.swayam2.ac.in/cec20_cs06/preview

2. https://www.cse.iitb.ac.in/~mythili/os/

3. https://onlinecourses.nptel.ac.in/noc21_cs72/preview

4. https://web.stanford.edu/~ouster/cgi-bin/cs140- spring20/lectures.php

5. https://oscourse.org/

6. https://www.cs.jhu.edu/~huang/cs318/fall21/schedule. html

**MCA I Semester**

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# MATHEMATICAL AND STATISTICAL FOUNDATIONS
## (24MCA1T05)

**Course Objectives:**

This course is aimed at enabling the students to

- To understand the mathematical fundamentals that are prerequisites for a variety of courses like Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems bioinformatics, Machine learning.

- To develop the understanding of the mathematical and logical basis to many modern techniques in computer science technology like machine learning, programming language design, and concurrency.

- To study various sampling and classification problems.

## UNIT-I:

**Basic Probability and Random Variables:** Random Experiments, Sample Spaces Events, the Concept of Probability the Axioms of Probability, Some Important Theorems on Probability Assignment of Probabilities, Conditional Probability Theorems on Conditional Probability, Independent Events, Bayes Theorem or Rule. Random Variables, Discrete Probability Distributions, Distribution Functions for Random Variables, Distribution Functions for Discrete Random Variables, Continuous Random Variables

## UNIT-II:

**Sampling and Estimation Theory:** Population and Sample, Statistical Inference Sampling With and Without Replacement Random Samples, Random Numbers Population Parameters Sample Statistics Sampling Distributions, Frequency Distributions, Relative Frequency Distributions, Computation of Mean, Variance, and Moments for Grouped Data. Unbiased Estimates and Efficient Estimates Point Estimates and Interval Estimates. Reliability Confidence Interval Estimates of Population Parameters, Maximum Likelihood Estimates

## UNIT-III:

**Tests of Hypothesis and Significance**: Statistical Decisions Statistical Hypotheses. Null Hypotheses Tests of Hypotheses and Significance Type I and Type II Errors Level of Significance Tests Involving the Normal Distribution One-Tailed and Two-Tailed Tests P Value Special Tests of Significance for Large Samples Special Tests of Significance for Small Samples Relationship between Estimation Theory and Hypothesis Testing

Operating Characteristic Curves. Power of a Test Quality Control Charts Fitting Theoretical Distributions to Sample Frequency Distributions, The Chi- Square Test for Goodness of Fit Contingency Tables Yates' Correction for Continuity Coefficient of Contingency.

## UNIT-IV:

**Algebraic Structures and Number Theory:** Algebraic Systems, Examples, General Properties, Semi Groups and Monoids, Homomorphism of Semi Groups Semi Groups and Monoids, Group, Subgroup, Abelian Group, Homomorphism, Isomorphism. Properties of Integers, Division Theorem, The Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic (Fermat's Theorem and Euler's Theorem)

## UNIT-V:

**Graph Theory:** Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Planar Graphs, Euler's Formula, Graph Coloring and Covering, Chromatic Number, Spanning Trees, Algorithms for Spanning Trees (Problems Only and Theorems without Proofs).

### *Text Books:*

1. Foundation Mathematics for Computer Science, 1st Edition, John Vince, Springer, 2015

2. Probability & Statistics,3rd Edition, Murray R. Spiegel, John J. Schiller and

   R. Alu Srinivasan, Schaum's Outline Series, Tata McGraw-Hill Publishers, 2018

3. Probability and Statistics with Reliability,2nd Edition, K. Trivedi,Wiley, 2011

   Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7th Edition, H. Rosen, Tata McGraw Hill, 2003

### *Reference Books:*

1. Probability and Computing: Randomized Algorithms and Probabilistic Analysis,1stEdition, M. Mitzenmacher and E. Upfal, 2005

2. Applied Combinatorics, 6th Edition, Alan Tucker, Wiley, 2012

### *Web Resources:*

1. https://archive.nptel.ac.in/courses/106/102/106102064/

2. https://ocw.mit.edu/courses/6-006-introduction-to-algorithms-spring-2020/video_galleries/lecture-videos/

3. https://www.cs.usfca.edu/~galles/visualization/Algorithms.html

4. https://visualgo.net/en

5. https://elearn.daffodilvarsity.edu.bd/course/view.php?id=11771

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**MCA I Semester**

# DATABASE MANAGEMENT SYSTEMS LAB (24MCA1L03)

## 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

1. Execute all DDL, DML and DCL commands on sample tables.

2. Implementation of different types of operators and built-in functions with Suitable examples.

3. Implementation of different types of joins with suitable examples.

4. Create views, partitions, Sequences for a particular DB

5. Implement different types of constraints on relations.

6. Implementation of subqueries and nested queries.

7. Implement Queries on Group By& Having Clauses, ALIAS, Sequence By, Order By

8. Control Structure

   a) Write a PL/SQL block for Addition of Two Numbers

   b) Write a PL/SQL block for IF, IF and else condition

   c) Write a PL/SQL block for implementation of loops

   d) Write a PL/SQL block for greatest of three numbers using IF AND ELSEIF

9. Exception Handling- Implement the following with respect to exception handling. Raising Exceptions, User Defined Exceptions, Pre-Defined Exceptions

10. Procedures

    a) Write a PL/SQL Procedure using Positional Parameters

    b) Write a PL/SQL Procedure using notational parameters

    c) Write a PL/SQL Procedure for GCD Numbers

    d) Write a PL/SQL Procedures for cursor implementation (explicit and implicit

cursors)

11. Functions:

    a) Write a PL/SQL block to implement factorial using functions

    b) Write a PL/SQL function to search an address from the given database

12. Write a DBMS program to prepare Pl/SQL reports for an application using functions.

13. Triggers:

    a) Write a Trigger to pop-up the DML operations

    b) Write a Trigger to check the age valid or not Using Message Alert.

    b) Create a Trigger on a table so that it will update another table while inserting values

14. Write PL/SQL block for an application using cursors and all types of triggers.

15. Write a PL/SQL block for transaction operations of a typical application using package

### Text Books / Suggested Readings:

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

### Web Resources:

1. https://moodle.sit.ac.in/blog/database-management-system-lab-component-bcs403/#P01

2. https://elearn.daffodilvarsity.edu.bd/course/view.php?id=10250

3. https://cs50.harvard.edu/x/2024/weeks/7/

4. https://courses.cs.washington.edu/courses/cse414/17au/calendar/hwlist.html

5. http://db.lcs.mit.edu/6.5830/2021/assign.php

**MCA I Semester**

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# DATA STRUCTURES USING C LAB (24MCA1L01)

## Course Objectives:

This Course will enable students to

- Design and implement various data structures.
- Implement operations like searching, insertion, and deletion, traversingmechanism
- Develop applications using data structure algorithms.

## Experiment 1:

a) Write a program in C to display the n terms of even natural numbers andtheir sum.

b) Write a program in C to display the n terms of harmonic series and theirsum. 1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n terms.

c) Write a C program to check whether a given number is an Armstrongnumber or not

d) Write a C program to calculate the factorial of a given number.

## Experiment 2:

a) Write a program in C for multiplication of two square Matrices.

b) Write a program in C to find the transpose of a given matrix.

## Experiment 3:

a) Write a program in C to check whether a number is a prime number or notusing the function.

b) Write a recursive program which computes the nth Fibonacci number, forappropriate values of n.

c) Write a program in C to add numbers using call by reference.

## Experiment 4:

a) Write a program in C to append multiple lines at the end of a text file.

b) Write a program in C to copy a file in another name

**Experiment 5:**

Write recursive program for the following

a) Write recursive and non recursive C program for calculation of Factorial of an integer.

b) Write recursive and non recursive C program for calculation of GCD (n, m)

a) Write recursive and non recursive C program for Towers of Hanoi: N disks are to be transferred from peg S to peg D with Peg I as the intermediate peg.

**Experiment 6:**

a) Write a C program that uses both recursive and non recursive functions to perform Linear search for a Key value in a given list.

b) Write a C program that uses both recursive and non recursive functions to perform Binary search for a Key value in a given list.

**Experiment 7:**

a) Write a C program that implements stack (its operations) using arrays.

b) Write a C program that implements stack (its operations) using Linke list.

**Experiment 8:**

a) Write a C program that uses Stack operations to convert infix expressions into postfix expressions.

a) Write a C program that implements Queue (its operations) using arrays.

b) Write a C program that implements Queue (its operations) using linked lists.

**Experiment 9:**

Write a C program that uses functions to create a singly linked list and perform various operations on it.

**Experiment 10:**

Write a C program to store a polynomial expression in memory using a linked list and perform polynomial addition.

### Experiment 11:

a) Write a recursive C program for traversing a binary tree in preorder, in order and post order.

b) Write a non recursive C program for traversing a binary tree in preorder, in order and post order.

### Experiment 12:

Implementation of Hash table using double hashing as collision resolution function.

### Experiment 13:

Implementation of Binary Search trees- Insertion and deletion.

### Experiment 14:

Implementation of AVL Tree **–** Insertion and Deletion

### Experiment 15:

a) Write a C program that implements Bubble sort, to sort a given list of integers in ascending order.

b) Write a C program that implements Quick sort, to sort a given list of integers in ascending order.

c) Write C program that implement Merge sort, to sort a given list of integers in ascending order

### *Web resources:*

1. https://ds1-iiith.vlabs.ac.in/
2. https://profile.iiita.ac.in/bibhas.ghoshal/teaching_ds_lab.html
3. https://moodle.sit.ac.in/blog/data-structures-laboratory/
4. https://dsalab.netlify.app/
5. https://www.vtuloop.com/data-structure-lab-programs-all/

**MCA I Semester**

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# OPERATING SYSTEMS AND LINUX LAB (24MCA1L04)

## Course Objectives:

■ This Course will enable students to implement CPU scheduling algorithms, Disk scheduling algorithms, Execute different types of Linux commands and Write shell scripts

## List of Experiments:

## UNIX Lab-Introduction to Unix

1.  Study of Unix/Linux general purpose utility commands

2.  Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system .

3.  Study of UNIX/LINUX File System (tree structure).

4.  C program to emulate the UNIX ls –l command

5.  C program that illustrates how to execute two commands concurrently with a command pipe. Ex: - ls –l | sort

6.  Multiprogramming-Memory management-Implementation of fork (), wait (), exec() and exit (), System calls

## Operating Systems Lab

1.  Simulate the Following CPU Scheduling Algorithms
    A) FCFS    B) SJF    C) Priority    D) Round Robin

2.  Multiprogramming-Memory Management- Implementation of fork(),wait(), exec() and exit()

3.  Simulate The Following

a.  Multiprogramming with A Fixed Number Of Tasks (MFT

b.  Multiprogramming with A Variable Number Of Tasks (MVT)

4.  Write a program to implement first fit, best fit and worst fit algorithm for memory management.

5.  Simulate Bankers Algorithm for Deadlock Avoidance

6.  Simulate Bankers Algorithm for DeadLock Prevention.

7.  Simulate The Following Page Replacement Algorithms.
    a) FIFO     b) LRU    c) LFU

8.  Simulate the Following File Allocation Strategies
    a) Sequenced     b) Indexed       c) Linked

## Linux Lab

1.  Write a Shell program to check whether a given number is prime or not.

2.  Write a shell script which will display Fibonacci series up to the given range.

3.  Write a shell script to check whether the given number is Armstrong or not.

4.  Write a shell script to the calculate the value of

5.  Write a shell script to accept student number, name, marks in 5 subjects.

6.  Find total, average and grade using the following rules:

    Avg>=80 then grade A

    Avg<80 &&Avg>=70 then grade B

    Avg<70 &&Avg>=60 then grade C

    Avg<60 &&Avg>=50 then grade D

    Avg<50 &&Avg>=40 then grade E

7.  Write a shell script to find minimum and maximum elements in the given list of elements.

8.  Write a shell program to check whether the given string is palindrome or not.

9.  Write an awk program to print sum, avg of students marks list

10. Write a shell script to compute no. of characters and words in each line of givenfile

### *Web Resources:*

1.  https://profile.iiita.ac.in/bibhas.ghoshal/teaching_os_lab.html

2.  https://profile.iiita.ac.in/bibhas.ghoshal/OS_2019/teaching_os_lab.html

3.  https://dextutor.com/courses/operating-system-programs/

4.  https://oscourse.org/labs/

5.  https://labex.io/courses/linux-practice-labs

6.  https://www.101labs.net/courses/101-labs-linux-lpic1/

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**MCA II Semester**

# COMPUTER NETWORKS (24MCA2T01)

## Course Objectives:

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

- To Understand the fundamental concepts of computer networking and OSI Reference model.

- To Familiarize the student with the basic taxonomy and terminology of the computer networking area.

- To learn and understand the advanced networking concepts, preparing the student for entry advanced courses in computer networking.

- To develop and gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

## UNIT–I

**Introduction**: Network Topologies WAN, LAN, MAN. Reference models, The OSI Reference Model, the TCP/ IP Reference Model, A Comparison of the OSI and TCP/IP Reference Models. **Physical Layer:** Introduction to physical layer, Data and Signals, Periodic analog signals, digital signals, transmission impairment, Data rate limits, performance, Introduction to Guided Media, Twisted-pair cable, Coaxial cable and Fiber optic cable and Unguided media: Wireless-Radio waves, microwaves, infrared.

## UNIT-II

**The Data Link Layer:** Services Provided to the Network Layer, Framing, Error Control, Flow Control, Error Detection and Correction, Error-Correcting Codes, Error Detecting Codes. **Elementary Data Link Protocols:** Simplex Protocol, A Simplex Stop and Wait Protocol for an Error free channel, A Simplex Stop and Wait Protocol for a Noisy Channel, Sliding Window Protocols, A One Bit Sliding Window Protocol, Go-Back-N, Selective Repeat.

## UNIT-III

**The Medium Access Control Sublayer-**The Channel Allocation Problem, Static Channel Allocation, Assumptions for Dynamic Channel Allocation, Multiple Access Protocols, Aloha, Pure aloha, slotted aloha, Carrier Sense Multiple Access Protocols, Collision-Free Protocols, Limited Contention Protocols. **Wireless LAN Protocols-** Ethernet,

Classic Ethernet Physical Layer, Classic Ethernet MAC Sublayer Protocol, Ethernet Performance, Fast Ethernet, Wireless LANs, The 802.11 Architecture and Protocol Stack, 802.11 Physical Layer, 802.11 MAC Sublayer Protocol, 805.11 Frame Structure, Services.

## UNIT-IV

**The Network Layer Design Issues:** Store and Forward Packet Switching, Services Provided to Transport layer, Implementation of Connection less Service, Implementation of Connection Oriented Service, Comparison of Virtual Circuit and Datagram  Networks, Routing  Algorithms, Optimality  principle, Shortest  path, Flooding, Distance vector, Link state, Hierarchical. **Congestion Control algorithms:** General  principles of congestion control, Congestion prevention policies, Approaches to Congestion Control, Traffic Aware Routing, Admission Control, Traffic Throttling, Load Shedding. **Internet Working:** How networks differ, How networks can be connected, Tunneling, internetwork routing, Fragmentation, network  layer in  the internet, IP protocols, IPV4 protocol, IP addresses, Subnets, IP Version6- The main IPV6 header, Internet control protocols- ICMP, ARP, DHCP.

## UNIT-V:

**The Transport Layer:** Transport layer protocols: Introduction, services, port number, User datagram protocol, User datagram, UDP services, UDP applications, Transmission control  protocol:  TCP  services-  TCP  features-  Segment- A TCP connection, windows in TCP, flow control, Error control. **Application Layer:** World Wide Web: HTTP, FTP, Two  connections,  control  connection,  Data  connection, security of FTP, Electronic mail, Architecture, web based mail, email  security, TELENET, local  versus  remote Logging.
**Domain Name System:** Name Space, DNS in Internet, Resolution, Caching, Resource Records,  DNS messages, Registrars, security of DNS Name Servers.

*Text Books:*

1. Computer Networks: Andrew S Tanenbaum David J. Wetherall, 5/e, Pearson

2. Data communications and networking: Behrouz Forouzan, 5/e, McGraw Hill

*Reference Books*

1. Computer Networks – A System Approach, Peterson, Bruce Davie,2/e ,Harcourt Asia

2. Compute communications and networking technologies, Gallo,Hancock, Cengage

3. An Engineering approach to compute networking, Kesha, Pearson

### *Web Resources:*

1.  https://onlinecourses.swayam2.ac.in/cec23_cs07/preview

2.  https://onlinecourses.nptel.ac.in/noc21_cs18/preview

3.  https://ocw.mit.edu/courses/6-829-computer-networks-fall-2002/pages/lecture-notes/

4.  https://www.sanfoundry.com/computer-network-basics/

5.  https://www.cisco.com/c/en_in/solutions/enterprise-networks/what-is-computer-networking.html

6.  https://www.cs.vu.nl/~ast/CN5/

**MCA II Semester**

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# NETWORK SECURITY AND CYBER SECURITY
## (24MCA2T02)

## Course Objectives:

- To learn various cryptographic algorithms including secret key cryptography, hashes and message digests, public key algorithms,

- To Familiar in design issues and working principles of various authentication protocols and various secure communication standards

- To understand the cybercrime fundamentals and preventive steps

## UNIT I:

**Basic Principles:** Security Goals, Cryptographic Attacks, Services and Mechanisms, Mathematics of Cryptography. Symmetric Encryption: Mathematics of Symmetric Key Cryptography, Introduction to Modern Symmetric Key Ciphers, Data Encryption Standard, Advanced Encryption Standard.

## UNIT II:

**Asymmetric Encryption:** Mathematics of Asymmetric Key Cryptography-Primes, primality Testing, Factorization, Asymmetric Key Cryptography-RSA Cryptosystem, Rabin Cryptosystem, ElGamal Cryptosystem, Elliptic Curve Cryptosystem

**Cryptographic Hash Functions:** Applications of Cryptographic Hash Functions, Two Simple Hash Functions Requirements and Security Hash Functions Based on Cipher Block Chaining, Secure Hash Algorithm (SHA), SHA-3

## UNIT III:

**Digital Signatures:** Elgamal Digital Signature Scheme, Schnorr Digital Signature, NIST Digital Signature Algorithm

**Electronic Mail Security:** Internet Mail Architecture, Email Formats, Email Threats and Comprehensive Email Security, S/MIME. IP Security: IP Security Policy, Encapsulating Security Payload, Combining Security Associations Internet KeyExchange

## UNIT IV:

**Introduction to Cybercrime:** Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Cybercriminals, Classifications of Cybercrime, Cyber stalking, Cyber cafe and Cybercrimes, Botnets. Attack Vector, Proliferation of Mobile and Wireless Devices, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones

## UNIT V:

Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, Sniffers, Spoofing, Session Hijacking Buffer overflow, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Identify theft, Foot Printing and Social Engineering, Port Scanning, Email Investigation, E-Mail Tracking, IP Tracking, EMail Recovery, Password Cracking,

### *Text Books:*

1. Cryptography and Network Security, 3rd Edition Behrouz A Forouzan, Deb deep Mukhopadhyay, McGraw Hill,2015
2. Sunit Belapure Nina Godbole "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", WILEY, 2011.

### *Reference Books:*

1. Network Security and Cryptography, First Edition, Bernard Meneges, Cengage Learning, 2018
2. Cryptography and Network Security, William Stallings, Global Edition, 7e Pearson, 2017

### *Web Resources:*

1. https://archive.nptel.ac.in/courses/106/105/106105162/
2. https://ebooks.inflibnet.ac.in/csp11/chapter/introduction-to-network- security/
3. https://www.fortinet.com/resources/cyberglossary/what-is- cryptography
4. https://ischoolonline.berkeley.edu/cybersecurity/curriculum/cryptograp hy/
5. https://www.mitel.com/articles/web-communication-cryptography-and-network-security
6. https://www.nist.gov/cybersecurity
7. https://www.codecademy.com/learn/introduction-to-cybersecurity

**MCA II Semester**

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# OBJECT ORIENTED PROGRAMMING USING JAVA
## (24MCA2T03)

**Course Objectives:**

To understand the basic concepts of object oriented programming concepts.

- To introduce the principles of inheritance and polymorphism and demonstrate how they are related to the design of abstract classes

- To understand the implementation of packages and interfaces

- To introduce the concept of multithreading and exception handling

- To learn and understand the design of Graphical User Interface using swingcontrols

## UNIT–I:

**Basics of Object Oriented Programming (OOP):** Need for OO paradigm , A way of viewing world- Agents, responsibility, messages, methods, classes and instances, class hierarchies (Inheritance), method binding, overriding and exceptions, summary of OOP concepts, coping with complexity, abstraction mechanisms. **Java Basics:** Data types, variables, scope and lifetime of variables, arrays, operators, expressions, control statements, type conversion and costing, simple java program, classes and objects-concepts of classes, objects, constructors methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing recursion, string handling.

## UNIT–II:

**Inheritance:** Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance-specialization, specification, construction,extension, limitation, combination, benefits of inheritance costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism, abstract classes. **Packages and Interfaces:** Defining, Creating and Accessing a package, Understanding CLASSPATH, Importing packages, differences between classes and interfaces, defining an interface, Implementing interface, applying interfaces variablesin interface and extending interfaces.

## UNIT–III:

**Exception handling and Multithreading**: Concepts of exception handling, benefits of

exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throws and finally, built in exceptions, creating own exception subclasses. Differences between multithreading and multitasking, thread lifecycle, creating threads, synchronizing threads, daemon threads, thread groups.

## UNIT–IV:

**Event Handling:** Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes, inner classes. The AWT class hierarchy, user-interface components- labels, button, canvas, scrollbars, text components, check box, checkbox groups, choices, list panes, scroll pane, dialogs, menu bar, graphics, layout manager, layout manager types- boarder, grid, flow, card and grid bag.

## UNIT-V:

**Swings:** Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JFrame and JComponent, Icons and Labels, text fields, buttons-The JButton class, Check boxes, Radio Buttons, Combo boxes, Tabbed panes, Scroll panes, Trees and Tables.

### Text Books:

1. Java-The Complete Reference,7/e, Herbert schildt, TMH

### Reference Books:

1. JAVA: How to program,8/e, Dietal, Dietal, PHI
2. Introduction of programming with JAVA, S. Dean, TMH
3. Introduction to JAVA programming, 6/e, Y. Daniel Liang, Pearson
4. Core Java 2, Vol 1 (Vol 2) Fundamentals (Advanced),7/e, Cay. S. Horstmann, Gary Cornell, Pearson
5. Big Java 2, 3/e, Cay. S. Horstmann, Wiley
6. Object Oriented Programming through Java, P. Radha Krishna, UniversityPress

### Web resources:

1. https://onlinecourses.nptel.ac.in/noc20_cs58/preview
2. https://www.iitk.ac.in/esc101/05Aug/tutorial/information/resources.html
3. https://docs.oracle.com/javase/tutorial/index.html
4. https://www.javacodegeeks.com/best-java-programming-resources

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**MCA II Semester**

# SOFTWARE ENGINEERING (24MCA2T04)

## Course Objectives:

- To understand the nature of software development and software life cycle models.

- To understand methods of capturing, specifying, visualizing and analyzing software requirements.

- To know the basics of testing and understanding the concept of software quality assurance and software configuration management process.

- To learn to provide correctness proofs for algorithms.

## UNIT–I:

**Introduction:** Software Engineering and its history, Software crisis, Evolving of a Programming System Product, Characteristics of Software, Brooks' No Silver Bullet, and Software Myths. **Software Development Life Cycles:** Software Development Process, Code-and-Fix model, Waterfall model, Evolutionary Model, Incremental Implementation, Prototyping, Spiral Model, Software Reuse, Critical Comparisons of SDLC models. **An Introduction to Non-Traditional Software Development Process:** Rational Unified Process, Rapid Application Development, Agile Development Process-Introduction, Agile- SCRUM (Sprint, Review, Retrospective, Planning) , XP, KANBAN, SAFE agile

## UNIT–II:

**Requirements:** Importance of Requirement Analysis, User needs, Software Features and Software Requirements. **Classes of User Requirements:** Enduring and Volatile, Sub phases of Requirement Analysis, Functional and Non-functional requirements, Barriers to Eliciting User requirements, The software requirements document and SRS standards, Requirements Engineering, Case Study of SRS for a Real Time System. **Tools for Requirements Gathering:** Document Flow Chart, Decision Table, Decision Tree, Introduction to non-traditional Requirements.

## UNIT-III:

**Software Design:** Goals of good software design, Design strategies and methodologies, Data oriented software design. **Structured Design:** Structure chart, Coupling,

Cohesion, Modular structure, Packaging, Object oriented design, Top-down and bottom-up approach, Design patterns. **Structured Analysis:** DFD, Data Dictionary, Software Measurement and Metrics: Various Size Oriented Measures: Halstead's software science, Function Point (FP) based measures, Cyclomatic Complexity Measures: Control flow graphs Development: Selecting a language, Coding guidelines, Writing code, Code documentation.

## UNIT–IV:

**Software Testing:** Testing process, Design of test cases, Functional Testing : Boundary value analysis, Equivalence class testing, Decision table testing, Cause effect graphing, Structural testing, Path testing, Data flow and mutation testing, Unit testing, Integration and system testing, Debugging, Alpha & beta testing, testing tools & standards.

## UNIT-V:

**Software Maintenance:** Management of maintenance, Maintenance process, Maintenance models, Regression testing, Reverse engineering, Software reengineering, Configuration management, documentation.

### *Text Books:*

1. Software Engineering: A Practitioner's Approach, R.S. Pressman, McGraw Hill, 9th Edition, Sept 2019

### *Reference Books:*

1. Software Engineering K.K. Aggarwal, Yogesh Singh, New Age International Publishers, Third Edition, 2007.

2. Software Engineering, Ian Sommerville, Addison Welsley, 9th Edition, 2010.

3. An Integrated Approach to Software Engineering, PankajJalote, Publishing House, 3rd Edition, 2007

### *Web Resources:*

1. https://onlinecourses.nptel.ac.in/noc23_cs122/preview

2. https://nptelvideos.com/course.php?id=444

3. https://softengbook.org/

4. https://www.coursera.org/learn/introduction-to-software-engineering?msockid= 39a584c9c8ac6773281697f5c91e6633

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# ARTIFICIAL INTELLIGENCE (24MCA2T05)

**Course Objectives:**

- To learn the basic State space representation. Intelligent Systems Categorization of Intelligent concepts and techniques of AI and machine learning

- To explore the various mechanisms of Knowledge and Reasoning used for building an expert system.

- To become familiar with supervised and unsupervised learning models

- To design and develop AI and machine learning solutions using modern tools.

## UNIT–I

**Introduction to AI:** Definition, Problem, System, Components of AI Program, Foundations of AI, Applications of AI, Current trends in AI, Intelligent Agents: Anatomy, structure, Types.

## UNIT–II

**Problem solving-** Solving problems by Searching: Problem Solving Agent, Formulating Problems. Uninformed Search Methods: Breadth First Search (BFS), Depth First Search (DFS), Depth First Iterative Deepening (DFID), Informed Search Methods-Greedy best first Search, A* Search, Memory bounded heuristic Search. Local Search Algorithms and Optimization Problems- Hill climbing search Simulated annealing and local beam search.

## UNIT–III

**Knowledge and Reasoning-**Knowledge based Agents, The Wumpus World, and Propositional logic**. First Order Logic** –Syntax and Semantic, Inference in FOL, Forward chaining, backward Chaining, Knowledge Engineering in First-Order Logic, Unification and Resolution.

## UNIT–IV

**Agents:** Definition of agents, Agent architectures (e.g., reactive, layered, cognitive), Multi-agent systems- Collaborating agents, Competitive agents, Swarm systems and biologically

inspired models. Expert Systems: Representing and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition.

## UNIT–V

**Expert Systems:** Architecture of expert systems, Roles of expert systems, Knowledge Acquisition, Meta knowledge, Heuristics. Expert systems- MYCIN, DART, XOON, Expert systems shells.

### *Text Books:*

1. Artificial Intelligence, Sarojkaushik, Cengage Learning India, 2011

2. Artificial Intelligence and Machine Learning, Vinod Chandra S.S., Anand Hareendran S

3. Stuart J. Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach" Second Edition, Pearson.

### *Reference Books:*

1. Ivan Bratko "PROLOG Programming for Artificial Intelligence", Pearson Education, Third Edition.

2. Elaine Rich and Kevin Knight "Artificial Intelligence ", Third Edition

3. Han Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann Publishers

4. G. Luger, W. A. Stubblefield, "Artificial Intelligence", Third Edition, Addiso Wesley Longman, 1998

### *Web Resources:*

1. https://onlinecourses.nptel.ac.in/noc22_cs56/preview

2. https://openlearning.mit.edu/news/explore-world-artificial-intelligence-online-courses-mit

3. https://cse.iitk.ac.in/users/cs365/2015/resources.html

4. https://microsoft.github.io/AI-For-Beginners/

5. https://artint.info/3e/resources/index.html

6. https://web.dev/explore/ai

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# DESIGN AND ANALYSIS OF ALGORITHMS (24MCA2PE1)

## Course Objectives:

- To analyze the asymptotic performance of algorithms.
- To understand and write rigorous correctness proofs for algorithms.
- To familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations.

## UNIT-I:

**Introduction:** Algorithm, Pseudo code for expressing algorithms, performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, probabilistic analysis, Amortized analysis. Disjoint Sets- disjoint set operations, union and find algorithms, spanning trees, connected components and bi- connected components.

## UNIT-II:

**Divide and conquer**: General method, applications-Binary search, Quick sort, Merge sort, Stassen's matrix multiplication. Greedy method: General method, applications-Job sequencing with deadlines, 0/1 knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

## UNIT-III:

**Dynamic Programming:** General method, applications-Matrix chain multiplication, Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Traveling salesperson problem, Reliability design.

## UNIT-IV:

**Backtracking:** General method, applications-n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles.

## UNIT-V:

**Branch and Bound:** General method, applications - Travelling salesperson problem, 0/1 knapsack problem-LC Branch and Bound solution, FIFO Branch and Bound solution. NP-Hard and NP-Complete problems: Basic concepts, non-deterministic algorithms, NP - Hard and NP Complete classes, Cook's theorem.

### Text Books:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, SatrajSahni and Rajasekaran, Universities Press

2. The Algorithm Design Manual, 2nd edition, Steven S. Skiena, Springer

3. Introduction to Algorithms, second edition, T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, PHI Pvt. Ltd

### Reference Books:

1. Introduction to the Design and Analysis of Algorithms, Anany Levitin, PEA

2. Design and Analysis of Algorithms, Pearson Education, Parag Himanshu Dave, Himansu Balachandra Dave

3. Introduction to Design and Analysis of Algorithms A strategic approach, R.C.T. Lee, S.S. Tseng, R.C. Chang and T. Tsai, McGraw Hill

4. Design and Analysis of algorithms, Pearson education, Aho, Ullman and Hopcroft

### Web Resources:

1. https://nptel.ac.in/courses/106106131

2. http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroTo Algorithms

3. https://ocw.mit.edu/courses/6-046j-design-and-analysis-of-algorithms-spring-2015/resources/lecture-notes/

4. https://ocw.mit.edu/courses/6-046j-design-and-analysis-of-algorithms-spring-2015/resources/lecture-notes/

5. https://aofa.cs.princeton.edu/home/

**MCA II Semester**

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# ADVANCED UNIX PROGRAMMING (24MCA2PE2)

**Course Objectives:**

- To understand the fundamental design of the Unix Programming
- To become fluent with the systems calls provided in the Unix environment
- To be able to design and build an application/service over the Unix operating system

## UNIT-I:

**Review of Unix Utilities and Shell Programming:**- File handling utilities, security by file permissions, process utilities, disk utilities, networking commands, backup utilities, text processing utilities.

**Shell Programming:** shell, shell responsibilities, pipes and input redirection, output redirection, here documents, the shell as a programming language, shell metacharacters, shell variables, shell commands, the environment, control structures, shell script examples.

## UNIT-II:

**Unix Files:** Unix file structure, directories, files and devices, System calls, library functions, low level file access, usage of open, create, read, write, close, lseek, stat, fstat, octl, umask, dup, dup2, Differences between system call and library functions. File and directory maintenance: chmod, chown, unlink, link, symlink, mkdir, rmdir, chdir, getcwd.

**Directory handling system calls:** opendir, readdir, closedir, rewinddir, seekdir, telldir

## UNIT-III:

**Unix Process:** Threads and Signals: process, process structure, starting new process, waiting for a process, zombie process, orphan process, process control, process identifiers, system call interface for process management, - fork, vfork, exit, wait, waitpid, exec, system.

**Signals**: Signal functions, unreliable signals, interrupted system calls, kill and raise functions, alarm, pause functions, abort, sleep functions.

## UNIT-IV:

**Inter process Communication:** Introduction to IPC, IPC between processes on a

single computer system, IPC between processes on different systems, pipes, FIFOs, message queues, semaphores and shared memory. Differences between pipes and FIFOs. Implementing a client server program using pipes and FIFOs.

**Message Queues-:** IPC, permission issues, Access permission modes, message structure, working with message queues, client/server example.

**Semaphores:** Creating semaphore sets, Unix kernel support for semaphores, Unix APIs for semaphores, file locking using semaphores.

## UNIT-V

**Shared Memory:** Working with shared memory segments, Unix kernel support for shared memory, client/server example.

**Sockets:** Berkeley sockets, socket structure, socket system calls for connection oriented protocol and connectionless protocol, implementing client server programs using TCP and UDP sockets.

### Text Books:

1. Advanced programming in the unix environment, w- Richard Stevens, 2nd Edition Pearson education
2. Unix Concepts and Applications, 3/e, Sumitabha Das, TMH

### Reference Books:

1. Unix and shell Programming, Sumitabha Das, TMH
2. A Beginner's Guide to Unix, N.P. Gopalan, B. Siva Selva, PHI
3. Unix Shell Programming, Stephen G. Kochan, Patrick Wood,
4. Unix Shell Programming, Lowell Jay Arthus & Ted Burns, 3/e, GalGotia

### Web Resources:

1. https://archive.nptel.ac.in/courses/117/106/117106113/
2. https://stevens.netmeister.org/631/
3. https://www.cs.fsu.edu/~asriniva/courses/aup02/lectures.html

**MCA II Semester**

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# DATA WAREHOUSING AND DATA MINING (24MCA2PE3)

**Course Objectives:**

- ■ Be familiar with mathematical foundations of data mining tools.

- ■ Understand and implement classical models and algorithms in data warehouses and data mining

- ■ Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.

- ■ Develop skill in selecting the appropriate data mining algorithm for solving practical problems.

## UNIT-I:

Introduction to Data mining, types of Data, Data Quality, Data Processing, Measures of Similarity and Dissimilarity, Exploring Data: Data Set, Summary Statistics, Visualization, Data Warehouse, OLAP and multidimensional data analysis.

## UNIT-II:

**Classification:** Basic Concepts, Decision Trees and model evaluation: General approach for solving a classification problem, Decision Tree induction, Model overfitting: due to presence of noise, due to lack of representation samples, Evaluating the performance of classifier. Nearest Neighbor classifier, Bayesian Classifier, Support vector Machines: Linear SVM, Separable and Non Separable case.

## UNIT-III:

**Association Analysis:** Problem Definition, Frequent Item-set generation, rule generation, compact representation of frequent item sets, FP-Growth Algorithms. Handling Categorical, Continuous attributes, Concept hierarchy, Sequential, Subgraph patterns

## UNIT-IV:

**Clustering:** Overview, K-means, Agglomerative Hierarchical clustering, DBSCAN, Cluster evaluation: overview, Unsupervised Cluster Evaluation using cohesion and separation, using proximity matrix, Scalable Clustering algorithm

**UNIT-V:**

**Web data mining:** Introduction, Web terminology and characteristics, Web content mining, Web usage mining, web structure mining, Search Engines: Characteristics, Functionality, Architecture, Ranking of Web Pages, Enterprise search

### *Text Books:*

1. Introduction to Data Mining, Tan, Steinbach and Vipin Kumar, Pearson Education, 2016

2. Data Mining: Concepts and Techniques, 2nd Edition, Jiawei Han and Micheline Kamber, ELSEVIER

3. Data Mining, Vikram Pudi and P Radha Krishna, Oxford University Press

### *Reference Books:*

1. Data Mining: The Text book, Springer, May2015, Charu C. Aggarwal.

### *Web resources:*

1. https://nptel.ac.in/courses/106/105/106105174/

2. https://www.saedsayad.com/data_mining.htm

3. https://ocw.mit.edu/courses/15-062-data-mining-spring-2003/pages/lecture- notes/

4. https://www2.cs.uh.edu/~arjun/courses/dm/

5. https://www.rdatamining.com/resources/online-documents-books-and- tutorials

6. https://dataminingbook.info/book_html/

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**MCA II Semester**

# MOOCS-1(NPTEL/SWAYAM) (24MCA2PE5)

## (Recommended 12 week course with 3 credits)

**MCA II Semester**

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# OBJECT ORIENTED PROGRAMMING USING JAVA LAB
## (**24MCA2L01**)

## Course Objectives:

- To understand how to design, implement, test, debug, and document programs that use basic data types and computation, simple I/O, conditional and control structures, string handling and functions.

- To understand the importance of Classes & objects along with constructors, Arrays and Vectors.

- Discuss the principles of inheritance, interface and packages and demonstrate through problem analysis assignments how they relate to the design of methods, abstract classes and interfaces and packages.

- To understand the importance of Multi-threading & different exception handling mechanisms.

- To learn experience of designing, implementing, testing, and debugging graphical user interfaces in Java using applet and AWT that respond to different user events.

- To understand Java Swings for designing GUI applications based on MVC architecture

## List of Experiments:

1. The Fibonacci sequence is defined by the following rule. The first 2 values in the sequence are 1, 1. Every subsequent value is the sum of the 2 values preceding it. Write a Java Program that uses both recursive and non recursive functions to print the nth value of the Fibonacci sequence.

2. Write a Java Program that prompts the user for an integer and then prints out all the prime numbers up to that Integer.

3. Write a Java Program that checks whether a given string is a palindrome or not. Ex. MALAYALAM is a palindrome

4. Write a Java Program for sorting a given list of names in ascending order.

5. Write a Java Program that illustrates how runtime polymorphism is achieved.

6. Write a Java Program to create and demonstrate packages.

7. Write a Java Program, using StringTokenizer class, which reads a line of integers and then displays each integer and the sum of all integers.

8. Write a Java Program that reads a file name form the user then displays information about whether the file exists, whether the file is readable/writable, the type of file and the length of the file in bytes and display the contents using File Input Stream class.

9. Write a Java Program that displays the number of characters, lines and words in a text/text file.

10. Write a Java Program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +-*?% operations. Add a text field to display the result.

11. Write a Java Program for handling mouse events.

12. Write a Java Program demonstrating the life cycle of a thread.

13. Write a Java Program that lets users create Pie charts. Design your own user interface (with Swings & AWT).

14. Write a Java Program to implement a Queue, using user defined Exception Handling (also make use of throw, throws).

## *Web Resources:*

1. https://www.iitk.ac.in/esc101/05Aug/tutorial/information/resources.html
2. https://labex.io/skilltrees/java
3. https://docs.oracle.com/javase/tutorial/index.html
4. https://introcs.cs.princeton.edu/java/home/

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**MCA II Semester**

# NETWORKS AND SECURITY LAB (24MCA2L02)

**Course Objectives:**

- ■ To learn basic understanding of cryptography, how it has evolved, and some key encryption techniques used today.

- ■ To understand and implement encryption and decryption using Caesar Cipher, Substitution Cipher, Hill Cipher.

**List of Experiments:**

1. Implement the data link layer farming methods such as character stuffing and bit stuffing.

2. Implement on a data set of characters the three CRC polynomial - CRC12, CRC 16 and CRC CCIP.

3. Implement Dijkstra's algorithm to compute the Shortest path thru a graph.

4. Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table art each node using distance vector routing algorithm

5. Take an example subnet of hosts. Obtain a broadcast tree for it.

6. Write a C program that contains a string (char pointer) with a value 'Hello World'. The program should XOR each character in this string with 0 and display the result.

7. Write a C program that contains a string (char pointer) with a value 'Hello World'. The program should AND or and XOR each character in this string with 127 and display the result

8. Write a Java program to perform encryption and decryption using the following algorithms:
    a) Caesar Cipher
    b) Substitution Cipher
    c) Hill Cipher

9. Write a Java program to implement the DES algorithm logic

10. Write a C/JAVA program to implement the BlowFish algorithm logic

11. Write a C/JAVA program to implement the Rijndael algorithm logic.

12. Using Java Cryptography, encrypt the text "Hello world" using BlowFish.

13. Create your own key using Java key tool.

   a) Write a Java program to implement RSA Algorithm

   b) Write a Java program to implement Public key Algorithm like El Gamal

   c) Implement the Diffie-Hellman Key Exchange mechanism using HTML

## Web Resources:

1. https://csrc.nist.rip/publications/nistpubs/800-12/800-12-html/chapter19.html

2. http://vlabs.iitkgp.ac.in/ant/

3. https://networklessons.com/labs/network-fundamentals-lab-1

4. https://elearn.daffodilvarsity.edu.bd/course/view.php?id=10230

5. https://www.cybrary.it/practice-lab/cryptography-basics

6. https://www.infosecinstitute.com/resources/cryptography/cryptographic-algorithms-lab/

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# EMPLOYABILITY SKILLS-I (24MCA2AC1)

## UNIT-I:
1. **Analytical Thinking & Listening Skills:** Self-Introduction, Shaping Young Minds - A Talk by AzimPremji (Listening Activity), Self – Analysis, Developing Positive Attitude, Perception.
2. **Communication Skills:** Verbal Communication; Non Verbal Communication (Body Language)

## UNIT-II:
1. **Self-Management Skills:** Anger Management, Stress Management, Time Management, Six Thinking Hats, Team Building, Leadership Qualities
2. **Etiquette**: Social Etiquette, Business Etiquette, Telephone Etiquette, Dining Etiquette

## UNIT-III:
3. **Standard Operation Methods:** Note Making, Note Taking, Minutes Preparation, Email & Letter Writing
4. **Verbal Ability:** Synonyms, Antonyms, One Word Substitutes-Correction of Sentences-Analogies, Spotting Errors, Sentence Completion, Course of Action - Sentences Assumptions, Sentence Arguments, Reading Comprehension, Practice work

## UNIT-IV:
5. **Job-Oriented Skills –I:** Group Discussion, Mock Group Discussions

## UNIT-V:
6. **Job-Oriented Skills –II:** Resume Preparation, Interview Skills, Mock Interviews

### *Text books and 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.

### *Web References:*
1. www. Indiabix.com
2. www.freshersworld.com