NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS

CURRICULUM STRUCTURE

and

DETAILED SYLLABI

(R24)

of

(Master of Computer Applications)
MCA

(Applicable for the Batches Admitted from 2024-25)

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS

Affiliated to JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

ACADEMIC REGULATIONS R24 FOR M.C.A. (REGULAR) DEGREE COURSE

Applicable for the students of M.C.A. Course from the Academic Year 2024-25 onwards. The M.C.A. Degree of Narasaraopeta Engineering College (Autonomous) affiliated to 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 the qualifying Entrance Test (AP ICET) conducted by the University/APSCHE 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 M.C.A. DEGREE

2.1 A student shall be declared eligible for the award of the M.C.A... Degree, if he pursues a course of study in not less than two 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.

3.0 MCA SUBJECT CATOGORY

Different types of Subject categories are noted below:

Code	Subject Category
PC	PROFESSIONAL CORE
PE	PROFESSINAL ELECTIVE
BH	BASIC SCIENCES AND HUMANITIES
NC	NON-CREDIT COURSE
PW	PROJECT WORK
MO	MOOC COURSE (ONLINE COURSE)
IN	INTERNSHIP

4.0 ATTENDANCE

4.1 A student shall be eligible to write end semester examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects/courses, and with minimum 50% in each and every course including practicals.

4.2 Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester shall be granted by the College Committee.

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

4.4 A prescribed fee shall be payable towards Condonation of shortage of attendance.

4.5 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 re-admission into that semester when offered next. If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for re-admission into the same class.

5.0 EVALUATION

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

5.1 For the theory subjects **60 marks** shall be awarded based on the performance in the End Semester Examination and **40 marks** shall be awarded based on the Internal Evaluation. The internal evaluation shall be made based on the **weighted average (80% best + 20% of least)** of the marks secured in the two Mid Term-Examinations conducted-one in the middle of the Semester and the other immediately after the completion of instruction. Each mid-term examination shall be conducted for a total duration of 120 minutes with 4 questions (without choice) each question for 10 marks. Two questions from first units and 3rd question from 2.0 to 2.5 unit and 4th question may be from any of the first 2 units. End semester examination is conducted for **60 marks.** Five questions (one question from each unit) to be answered (either or).

5.2 For practical subjects, **60 marks** shall be awarded based on the performance in the End Semester Examinations and **40 marks** shall be awarded based on the day-to-day performance as Internal Marks. The internal evaluation based on the day to day work-10 marks, record-10 marks and the remaining 20 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the examiners, with a breakup marks of Procedure-20, Experimentation-20, Results-10, Viva-voce-10.

5.3 For Mini Project with Seminar, a student under the supervision of a faculty member, shall collect the literature on a topic and critically review the literature and submit it to the department in a report form and shall make an oral presentation before the Project Review Committee consisting of Head of the Department, supervisor/mentor and two other senior faculty members of the department. For Mini Project with Seminar, there will be only internal evaluation of 100 marks. A candidate has to secure a minimum of 50% of marks to be declared successful.

5.4 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. In case the candidate does not secure the minimum academic requirement in any subject (as specified in 5.4) he has to re-appear 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 shall stands cancelled. For re- registration the candidates have to apply by paying the requisite fees and get approval from the Principal before the start of the semester in which re-registration is required.

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

5.6 Laboratory examination for M.C.A. courses must be conducted with two Examiners, one of them being the Laboratory Class Teacher and the second examiner shall be external from the other reputed institutions.

6.0 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.

6.1 A Project Review Committee (PRC) shall be constituted with Head of the Department and two other senior faculty members in the department.

6.2 Registration of Dissertation/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.

6.3 After satisfying 6.2, a candidate has to submit, in consultation with his project supervisor, the title, objective and plan of action of his project work for approval. The student can initiate the Project work, only after obtaining the approval from the Project Review Committee (PRC).

6.4 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 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.

6.5 Continuous assessment of Project Work will be monitored by the PRC.

6.6 A candidate shall submit his status report in two stages to the PRC, at least with a gap of 3 months between them.

6.7 A candidate is permitted to submit Project Thesis only after the approval of PRC.

6.8 Three copies of the Project Thesis certified by the supervisor shall be submitted to the College.

6.9 The thesis shall be adjudicated by one examiner selected by the Principal. For this, the HOD shall submit a panel of 3 examiners, eminent in that field, with the help of the guide concerned.

6.10 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 Principal.

6.11 The Head of the Department shall coordinate and make arrangements for the conduct of Viva-Voce examination.

6.12 If the report of the examiner is favorable, Viva - Voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the Examiner who adjudicated the Thesis. The Board shall jointly report the candidate's work for a maximum of 200 marks.

6.13 If the report of the Viva -Voce is unsatisfactory (i.e., <50 % of 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 Principal.

7.0 Cumulative Grade Point Average (CGPA)

Marks Range Theory/ Laboratory (Max – 100)	Marks Range Mini Project/ Project Work or Dissertation (Max – 100)	Letter Grade	Level	Grade Point
≥ 90	≥ 90	A	Excellent	10
≥80 to <90	≥80 to <90	B	Very Good	9
≥70 to <80	≥70 to <80	C	Good	8
≥60 to <70	≥60 to <70	D	Fair	7
≥50 to <60	≥50 to <60	E	Satisfactory	6
<50	<50	F	Fail	0
		AB	Absent	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
- **SGPA (Si) = $\sum$ (Ci X Gi) / $\sum$ Ci**
- Where Ci is the number of credits of the ith course and Gi 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.
- **CGPA = $\sum$ (Ci X Si) / $\sum$ Ci**
- Where Si is the SGPA of the i^{th} semester and Ci is the total number of credits in that semester.
- The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.
- Equivalent Percentage = (CGPA – 0.75) x 10

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8.0 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	≥ 6.75	
Second Class	≥ 6.0 to < 6.75	

The Grades secured, Grade points and Credits obtained will be shown separately in the memorandum of marks.

9.0 WITHHOLDING OF RESULTS

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

10.0 TRANSITORY REGULATIONS (for R24)

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

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

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, the decision of the Principal is final.

11.4 The College 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 College.

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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. The Hall Ticket of the candidate is to be cancelled.
3.	Impersonates any other candidate in	The candidate who has impersonated shall

	connection with the examination.	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 Semester 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 Semester 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 –	In case of students of the college, they shall be expelled from examination halls and

	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.	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 University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.

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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.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions : (if the squad reports that the college is also involved in encouraging malpractices)
   (i) A show cause notice shall be issued to the college.
   (ii) Impose a suitable fine on the college.
   (iii) Shifting the examination centre from the college to another college for a specific period of not less than one year

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I SEMESTER

S.No	Course Code	Course Name	Category	L	T	P	Credits
1	R24MCA1101	Data Structures	PC	3	0	0	3
2	R24MCA1102	Computer Organization	PC	3	0	0	3
3	R24MCA1103	Database Management Systems	PC	3	0	0	3
4	R24MCA1104	Operating Systems	PC	3	0	0	3
5	R24MCA1105	Mathematical and Statistical Foundations	BS&H	3	1	0	4
6	R24MCA11L1	Database Management Systems Lab	PC	0	0	3	1.5
7	R24MCA11L2	Data Structures using C Lab	PC	0	0	4	2
8	R24MCA11L3	Operating Systems and Linux Lab	PC	0	0	3	1.5
			Total	15	1	10	21

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II SEMESTER

S.No	Course Code	Course Name	Category	L	T	P	Credits
1	R24MCA1201	Computer Networks	PC	3	0	0	3
2	R24MCA1202	Network Security and Cyber Security	PC	3	0	0	3
3	R24MCA1203	Object Oriented Programming Using JAVA	PC	3	0	0	3
4	R24MCA1204	Software Engineering	PC	3	0	0	3
5	R24MCA1205	Artificial Intelligence	PC	3	0	0	3
6	**Program Elective-1**						
	R24MCA1206	1. Design and Analysis of Algorithms	PC/ PE	3	0	0	3
	R24MCA1207	2. Advanced Unix Programming					
	R24MCA1208	3. Data Warehousing and Data mining					
	R24MCA12MC	4. MOOCS-1(NPTEL /SWAYAM) (Recommended 12 week course with 3 credits)					
7	R24MCA12L1	Object Oriented Programming Using JAVA Lab	PC	0	0	3	1.5
8	R24MCA12L2	Networks and Security Lab	PC	0	0	3	1.5
9	R24MCA12MNC	Employability Skills-1[$]	AC	1	0	0	0
			Total	19	0	6	21

*This may be conducted in Zero Hour.

[$]Internal Evaluation

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| I MCA I SEMESTER | L | T | P | INTERNAL MARKS | EXTERNAL MARKS | TOTAL MARKS | CREDITS |
|---|---|---|---|---|---|---|---|
| R24MCA1101 | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **DATA STRUCTURES** | | | | | | | |

**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

**Course Outcomes:**

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

CO1: Make use of control structures and arrays in developing modular programs. [K3]
CO2: Make use of functions, structures, pointers and files to write well-structured programs. [K3]
CO3: Analyze basic data structures and Linked List. [K4]
CO4: Analyze Stacks, Queues and Hashing techniques to solve problems. [K3]
CO5: Apply Sorting techniques to solve problems and involve advanced concepts of Trees. [K3]

**UNIT-I**:

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

**UNIT-II:**

Storage classes, Functions, Structures and Unions, Pointers, Dynamic Memory Allocation functions 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
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**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
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| I MCA I SEMESTER | L | T | P | INTERNAL MARKS | EXTERNAL MARKS | TOTAL MARKS | CREDITS |
|---|---|---|---|---|---|---|---|
| R24MCA1102 | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **COMPUTER ORGANIZATION** | | | | | | | |

**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.

**Course Outcomes:**

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

CO1: Interpret the basic structure of computers and its operational concepts. [K2]

CO2: Develop the assembly language programming and demonstrate the addressing modes used in instructions. [K3]

CO3: Interpret various I/O interface devices. [K2]

CO4: Develop Main Memory Interfacing Circuit and can apply various cache memory mapping techniques. [K3]

CO5: Summarize the parallel processing and pipelining concepts. [K2]

**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 and Characters, Memory locations 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
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**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, McGraw Hill

**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 ramaDandamudi Springer 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/
   http://williamstallings.com/COA/COA8e-student/index.html
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| I MCA I SEMESTER | L | T | P | INTERNAL MARKS | EXTERNAL MARKS | TOTAL MARKS | CREDITS |
|---|---|---|---|---|---|---|---|
| R24MCA1103 | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **DATABASE MANAGEMENT SYSTEMS** | | | | | | | |

**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

**Course Outcomes**

After completion of the course, the students would be able to:
CO1 : Interpret the fundamentals of DBMS. [K2]
CO2 : Analyze DB design methodology and normalization process. [K4]
CO3 : Develop Queries in RDBMS. [K3]
CO4 : Compare and Contrast various transaction and concurrency management techniques. [K2]
CO5 : Analyze various file organizations and indexing techniques. [K4]

**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]
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**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 RamezElmasri, ShamkantB.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.ht ml
   https://www.db-book.com/slides-dir/index.html
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| I MCA I SEMESTER | L | T | P | INTERNAL MARKS | EXTERNAL MARKS | TOTAL MARKS | CREDITS |
|---|---|---|---|---|---|---|---|
| R24MCA1104 | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **OPERATING SYSTEMS** | | | | | | | |

**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.

**Course Outcomes**

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

CO 1: Classify various operating system functionalities and generations. [K2]

CO 2: Interpret process management and Apply various process scheduling algorithms. [K3]

CO 3: Interpret process synchronization techniques and apply various deadlock techniques. [K4]

CO 4: Distinguish various memory management techniques and disk scheduling algorithms and can interpret the file system implementations. [K4]

CO 5: Experiment with the installation and use of different software like Windows 7 and Linux [K3]

**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
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**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, Greg Gagne, 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/previ ew
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
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| I MCA I SEMESTER | L | T | P | INTERNAL MARKS | EXTERNAL MARKS | TOTAL MARKS | CREDITS |
|---|---|---|---|---|---|---|---|
| R24MCA1105 | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| **Mathematical and Statistical Foundations** | | | | | | | |

**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 many basis to modern techniques in computer science technology like learning, machine programming language design, and concurrency.
- To study various sampling and classification problems.

**Course Outcomes**

After completion of the course, the students would be able to:
CO1: Apply Random variables and continuous probability distributions [K3]
CO2: Infer the statistical inferential methods based on small and large sampling tests [K4].
CO3: Design the components of a classical hypothesis test [K3]
CO4: Apply Number Theory concepts and Algebraic structures to solve problems. [K3]
CO5: Classify the types of graphs to formulate and solve computational problems. [K4].

**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 T eory:** 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-HillPublishers,2018
3. Probability and Statistics with Reliability,2nd Edition,K.Trivedi,Wiley,2011
4. 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,1st Edition, M. Mitzenmacher and E. Upfal, 2005
2. Applied Combinatorics,6th Edition, Alan Tucker, Wiley, 2012

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**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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| I MCA I SEMESTER | L | T | P | INTERNAL MARKS | EXTERNAL MARKS | TOTAL MARKS | CREDITS |
|---|---|---|---|---|---|---|---|
| R24MCA11L1 | 0 | 0 | 3 | 40 | 60 | 100 | 1.5 |
| **DATABASE MANAGEMENT SYSTEM 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**

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

CO1 : Apply SQL commands like DDL, DML and DCL to perform different Database operations [K3].
CO2 : Develop PL/SQL block statements, control statements and cursors. [K3]
CO3 : Develop PL/SQL programs using functions and procedures. [K3]
CO4 : Develop PL/SQL programs using packages and Triggers. [K3]

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.
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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.

    c) 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

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| I MCA I SEMESTER | L | T | P | INTERNAL MARKS | EXTERNAL MARKS | TOTAL MARKS | CREDITS |
|---|---|---|---|---|---|---|---|
| R24MCA11L2 | 0 | 0 | 4 | 40 | 60 | 100 | 2 |
| **DATASTRUCTURE USING C LAB** | | | | | | | |

**Course Objectives:**

This Course will enable students to

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

**Course Outcomes**

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

CO 1: Analyze the use of conditional and looping statements to solve problems associated with conditions and repetitions. [K4]

CO 2: Analyze algorithms, Searching, Sorting and hashing Techniques [K4].

CO 3: Make use of elementary data structures such as stacks, Queues and linked list to develop their applications.

CO 4: Examine different tree traversal techniques.

**Experiment 1:**

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

b) 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 ... 1/n terms.

c) Write a C program to check whether a given number is an Armstrong number 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 not using the function.

b) Write a recursive program which computes the nth Fibonacci number, for appropriate 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
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**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)

c) 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.
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**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/
   https://www.vtuloop.com/data-structure-lab-programs-all/
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| I MCA I SEMESTER | L | T | P | INTERNAL MARKS | EXTERNAL MARKS | TOTAL MARKS | CREDITS |
|---|---|---|---|---|---|---|---|
| R24MCA11L3 | 0 | 0 | 3 | 40 | 60 | 100 | 1.5 |

**OPERATING SYSTEMS AND LINUX LAB**

**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

**Course Outcomes**

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

CO 1: Apply the fundamental UNIX utilities and Utilize the Unix file system[K3]
CO 2: Experiment with shell and UNIX filters. [K3]
CO 3: Implement routing algorithms.
CO 4: Solve the experiments on scheduling Algorithms and page replacement algorithms.
CO 5: Handle the deadlocks, like prevention and detection.

**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
```

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**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 given file

**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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| I MCA | L | T | P | Internal Marks | External Marks | Total Marks | Credit |
|---|---|---|---|---|---|---|---|
| R24MCA1201 | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **COMPUTER NETWORKS** | | | | | | | |

**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.

**Course Outcomes**

After completion of the course, the students would be able to:
CO 1: Summarize basic concepts of Data Communication and Networking. [K2]
CO 2: Compare and Contrast OSI and TCP/IP reference models. [K2]
CO 3: Interpret data link layer services and multiple access protocols. [K2]
CO 4: Analyse different routing protocols. [K4]
CO 5: Illustrate the essential principles of different transport layer and application layer protocols. [K2]

**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.
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**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 in connected, Tunneling, internetwork routing, Fragmentation, network layer 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: BehrouzForouzan, 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
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**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/
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NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

``` **DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS**

| I MCA | L | T | P | Internal Marks | External Marks | Total Marks | Credit |
|---|---|---|---|---|---|---|---|
| R24MCA1202 | 3 | 0 | 0 | 40 | 60 | 100 | 3 |

**NETWORK SECURITY AND CYBER SECURITY**

**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

**Course Outcomes**

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

CO1 : Summarize the fundamentals of Cryptography. [K2]
CO2 : Analyse how security is achieved, and attacks can be countered by using asymmetric algorithms. [K4]
CO3 : Interpret the role of hash functions and Digital Signatures in Information Security.[K2]
CO4 : : Interpret Cyber Security architecture principles [K2].
CO5 : : Identifying different classes of attacks [K3].

**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 Key Exchange
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``` **DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS**

**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, FootPrinting and Social Engineering, Port Scanning, EMailInvestigation, 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
3. Introduction to Cyber Security, Ajay Singh April 2024

**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
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| I MCA | L | T | P | Internal Marks | External Marks | Total Marks | Credit |
|---|---|---|---|---|---|---|---|
| R24MCA1203 | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **OBJECT ORIENTED PROGRAMMING USING JAVA** | | | | | | | |

**Course Objectives:**

- To understand the basic concepts of object oriented programming concepts.
- To introduce the principles of inheritance and polymorphism 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 swing controls

**Course Outcomes**

After completion of the course, the students would be able to:
CO1: Interpret the syntax and semantics of java programming language and OOPs concepts [K2].
CO2: Make use of different predefined classes and packages to develop programmes using OOPs concepts [K3].
CO3: Apply exception handling and multithreading on java programs [K3].
CO4: Develop Java Programmes using collection frame work & I/O [K3].
CO5: Make use of Applets, AWT and event-handling to develop GUI [K3]

**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 variables in interface and extending interfaces.
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**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 Tabbed boxes, panes, Scroll panes, Trees and Tables. Introduction to Java FX.

**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 Java2, Vol1(Vol2) 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, University Press

**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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| I MCA | L | T | P | Internal Marks | External Marks | Total Marks | Credit |
|---|---|---|---|---|---|---|---|
| R24MCA1204 | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **SOFTWARE ENGINEERING** | | | | | | | |

**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.

**Course Outcomes**

After completion of the course, the students would be able to:
CO 1: Analyze Software Life Cycle models. [K4]
CO 2: Analyze the importance of software requirement and project management [K4]
CO 3: Analyze various types of software design techniques [K4]
CO 4: Analyze Software testing and quality management [K4].
CO 5: Analyze various CASE tools and software maintenance process models. [K4]

**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.
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**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, Narosa 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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| I MCA | L | T | P | Internal Marks | External Marks | Total Marks | Credit |
|---|---|---|---|---|---|---|---|
| R24MCA1205 | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **ARTIFICIAL INTELLIGENCE** | | | | | | | |

**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.

**Course Outcomes**

After completion of the course, the students would be able to:
CO1: Analyse and Design Intelligent Agents [K4]
CO2: Apply Search Algorithms to Problem Solving [K3]
CO3: Apply techniques for constraint propagation and reasoning under uncertainty [K3]
CO4: Utilize inductive learning, decision trees, and explanation-based learning for learning from observation [K3]
CO5: Analyse and compare typical expert systems such as MYCIN, DART, and XCON [K4]

**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.
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**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, AddisoWesley 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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| MCA | L | T | P | Internal Marks | External Marks | Total Marks | Credit |
|---|---|---|---|---|---|---|---|
| R24MCA1206 | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **DESIGN AND ANALYSIS OF ALGORITHMS** | | | | | | | |

**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.

**Course Outcomes**

After completion of the course, the students would be able to:
CO 1: Apply asymptotic notations to measure the performance of algorithms [K3]
CO 2: Apply divide-and-conquer paradigm when an algorithmic design situation calls for it [K3].
CO 3: Apply dynamic-programming approach, to solve real world problems [K3].
CO 4: Apply fundamental graph traversal techniques to solve various applications using Backtracking [K3].
CO 5: Analyse least cost and FIFO branch and bound paradigms [K4].

**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.
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**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, AnanyLevitin, PEA
2. Design and Analysis of Algorithms, Pearson Education, ParagHimanshu Dave, HimansuBalachandra 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=IntroToAlgorithms
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/
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| I MCA | L | T | P | Internal Marks | External Marks | Total Marks | Credit |
|---|---|---|---|---|---|---|---|
| R24MCA1207 | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **ADVANCED UNIX PROGRAMMING** | | | | | | | |

**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

**Course Outcomes**

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

CO1: Summarize the internal structure of the UNIX operating system, including the kernel, file systems, processes, and memory management. [K2]

CO2: Interpret complex shell scripts for automating system tasks and processes in UNIX environments. [K2]

CO3: Make use of system calls for low-level programming tasks such as file handling, process control, and communication between programs. [K3]

CO4: Apply IPC techniques, including pipes, message queues, shared memory, and semaphores, to facilitate communication between processes [K4]

CO5: Utilize and manage process scheduling techniques and synchronization Compare various Memory Management Schemes [K3]

**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 la guage, 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
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**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.SivaSelva, 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
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NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

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| I MCA | L | T | P | Internal Marks | External Marks | Total Marks | Credit |
|---|---|---|---|---|---|---|---|
| R24MCA1208 | 3 | 0 | 0 | 40 | 60 | 100 | 3 |

**DATA WAREHOUSING AND DATA MINING**

**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.

**Course Outcomes**

After completion of the course, the students would be able to:
CO 1: Interpret the data mining terminology and types of data to be mined. [K2]
CO 2: Compare and contrast different dominant Data Mining Algorithms for Classification and apply them. [K4]
CO 3: Analyze the performance of Association Rules. [K4]
CO 4: Compare and contrast different dominant Data Mining Algorithms for Clustering and apply them. [K4]
CO 5: Interpret web data miming concepts and operations. [K2]

**UNIT-1:**

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
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**UNIT-V:**

**Web data mining:** Introduction, Web terminology and characteristics, Web co tent 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 MichelineKamber, ELSEVIER
3. Data Mining, VikramPudi and P Radha Krishna, Oxford University Press

**Reference Books:**

1. DataMining: TheTextbook,Springer,May2015,CharuC.Aggarwal.
2. Fundamentals of Data Warehouse, 2/e, Jarke, Lenzerini, Vassiliou, Vassiliadis,Springer.

**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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| I MCA | L | T | P | Internal Marks | External Marks | Total Marks | Credit |
|---|---|---|---|---|---|---|---|
| R24MCA12L1 | 0 | 0 | 3 | 40 | 60 | 100 | 1.5 |

**OBJECT ORIENTED PROGRAMMING USING JAVA LAB**

**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

**Course Outcomes**

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

CO1 : Develop java programs by using OOP concepts [K3].

CO2 : Make use of interfaces, threads, applets in developinging JAVA programmes [K3].

CO3 : Make use of exception handling and collections in Java Programming[K3].

CO4 : Develop java components [K3].

**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
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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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| I MCA | L | T | P | Internal Marks | External Marks | Total Marks | Credit |
|---|---|---|---|---|---|---|---|
| R24MCA12L2 | 0 | 0 | 3 | 40 | 60 | 100 | 1.5 |
| **NETWORKS AND SECURITY LAB** | | | | | | | |

**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.

**Course Outcomes**

After completion of the course, the students would be able to:
CO1: Analyze security concepts and type of attacks and network security algorithms. [K4]
CO2: Apply symmetric and asymmetric key cryptography technique to encrypt and decrypt text. [K4]
CO3: Apply Cryptography Hash Function for message authentication and to solve other applications. [K3]

**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
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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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| I MCA | L | T | P | Internal Marks | External Marks | Total Marks | Credit |
|---|---|---|---|---|---|---|---|
| R24MCA12MNC | 1 | 0 | 0 | 40 | 60 | 100 | 0 |
| **EMPLOYABILITY SKILLS-I** | | | | | | | |

**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
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