Aditya Institute of Technology and Management

ACADEMIC REGULATIONS (AR24)

For

Master of Computer Applications (MCA) Programme

(Duration: Two Years)

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

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)
Approved by AICTE, Accredited by NBA & NAAC,
Recognized under 2(f) and 12(b) of UGC
Permanently Affiliated to JNTUGV, Vizianagaram
K. Kotturu, Tekkali, Srikakulam-532201, Andhra Pradesh, India

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT

INSTITUTE VISION

To evolve into a premier engineering institute in the country by continuously enhancing the range of our competencies, expanding the gamut of our activities and extending the frontiers of our operations.

INSTITUTE MISSION

Synergizing knowledge, technology and human resources, we impart the best quality education in Technology and Management. In the process, we make education more objective so that the efficiency for employability increases on a continued basis.

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT

DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS

DEPARTMENT VISION & MISSION

VISION

Empowering holistic computer application professionals to spearhead innovation and entrepreneurship in the digital world.

MISSION

M1: Bridge the gap between theoretical computer application principles and their practice in the information technology domain through industry focused curriculum.

M2: Encourage students to think critically, design solutions, and embrace innovation in the digital world.

M3: Foster a culture of continuous learning, equipping students to adapt to the ever- evolving landscape of technology.

M4: Produce multifaceted IT professionals who are technically skilled, ethically conscious, and socially responsible.

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT

DEPARTMENT OF MASTERS OF COMPUTER APPLICATIONS

PROGRAM EDUCATION OBJECTIVES

PEO 1: Use technology and knowledge to analyze, design, and evaluate advanced computing systems for addressing societal challenges.

PEO 2: Pursue research initiatives or achieve success as an entrepreneur.

PEO 3: Commit to lifelong learning through collaborative efforts and adherence to ethical practices.

PROGRAM OUTCOMES

PO 1: Leverage mathematical foundations and core computer science concepts to design and implement efficient solutions aligned with industry standards.

PO 2: Analyze, design, and solve complex computational problems by integrating domain knowledge, advanced methodologies, and emerging technologies.

PO 3: Use expertise and innovative methods to develop efficient IT applications using technical expertise to excel as competent and versatile professionals in the field of information technology.

PO 4: Exhibit effective communication and collaborative skills to contribute effectively in diverse, multidisciplinary, and global teams.

PO 5: Address societal challenges by designing ethical, inclusive, and sustainable technological solutions that enhance community well-being.

PO 6: Demonstrate expertise in software project management, embrace continuous professional development, and adapt effectively to evolving technological and organizational landscapes.

PROGRAM SPECIFIC OUTCOMES

PSO 1: Develop innovative solutions for real-world challenges by leveraging domain- specific knowledge, emerging technologies, and interdisciplinary approaches.

PSO 2: Apply knowledge in various domains to satisfy the needs of project management, solutions to new ideas and entrepreneurship.

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ACADEMIC REGULATIONS

Applicable for the students of Master of Computer Applications (MCA) PG Programme admitted from the Academic Year 2024-25 onwards. The MCA Degree of Aditya Institute of Technology and Management shall be conferred on candidates who are admitted to the program and who fulfill all the requirements for the award of the Degree.

1. ELIGIBILITY FOR ADMISSIONS:

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

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

2. AWARD OF MCA DEGREE:

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

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

The minimum instruction days in each semester are 90.

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

Credit Definition

1 Hour Lecture (L) per week	1 Credit
1 Hour Tutorial (T) per week	1 Credit
1 Hour Practical (P) per week	0.5 Credit
2 Hours Practical (Lab) per week	1 Credit

3. ATTENDANCE:

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

Condonation of shortage of attendance up to 10% (65% and above, and below 75%) may be given by the College academic committee.

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

Shortage of attendance below 65% shall in NO case be condoned.

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

A stipulated fee shall be payable towards condonation of shortage of attendance.

4. EVALUATION:

The performance of the candidate in each semester shall be evaluated subject-wise with a maximum of 100 marks on the basis of continuous Internal Exams (30 marks) and End Semester Examination (70 marks).

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.

Theory Subject:

For theory subjects, during a semester, there shall be two midterm examinations. Each midterm examination shall be conducted for a duration of 120 minutes and contains five descriptive questions (without choice), each question for 10 marks, and it will be scaled down to 30 marks.

Weightage of Marks					
	No. of questions	**I MID**		**No. of questions**	**II MID**
I Unit	2	20 Marks	III Unit	1	10 Marks
II Unit	2	20 Marks	IV Unit	2	20 Marks
III Unit	1	10 Marks	V Unit	2	20 Marks

The first midterm examination will be conducted usually after completion of 50% syllabus (i.e. first 2.5 Units), and the second midterm examination will be conducted usually at the end of instructions (after completion of remaining 50% syllabus i.e. remaining 2.5 Units).

Internal marks can be calculated with 80% weightage for better of the two midterm exams and 20% weightage for another midterm exam.

The end semester examinations (70 marks) shall be conducted by the examination for duration of 180 minutes and contains five descriptive questions, each question for 14 marks. Each of these questions may contain sub-questions. For each question there will be an “either” “or” choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

Laboratory:

The internal marks for laboratory are 30 marks and the marks shall be awarded based on the day to day work-5 marks, record-5 marks and the remaining 20 marks to be awarded by conducting an internal laboratory test.

External marks for laboratory are 70 marks and shall be awarded based on the performance in the end laboratory examinations. Laboratory examination must be conducted with two Examiners, one of them being the Laboratory Class Teacher and the external examiner shall be from the other autonomous institution. Laboratory examination must be conducted with breakup of description-10 marks, programming code-20 marks, output-20 marks, and viva-voce-20 marks.

Socially Relevant Project using design thinking:

For internal evaluation (**30** marks), a group of students (maximum of five) have to complete a project and project culminates in a group presentation assessed by an internal committee formed by the Head of the Department.

Semester-end examination (**70** marks) will be conducted in the form of a Viva-Voce and is overseen by an external examiner and the internal supervisor.

Internship/industry oriented mini project (minimum 6 weeks):

There shall be an internship/industry oriented mini project, one need to complete during semester break (i.e., II-semester to III-semester).

Self study report for the Internship/report on mini project after II semester shall be submitted and evaluated during the III semester.

The Self study report for the Internship/report on mini project will be evaluated for a total of 100 marks consisting of 30 marks for internal assessment and 70 marks for semester-end examination.

Internal assessment shall be done by internal supervisor.

The semester-end examination (Viva-Voce) shall be conducted by the committee,

consisting of an external examiner, head of the department and internal supervisor of the Internship/industry oriented mini project.

5. PROJECT/DISSERTATION WORK EVALUATION:

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

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

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

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

If a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the 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.

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

A candidate is permitted to submit Project Thesis only after the approval of PRC not earlier than 20 weeks from the date of registration of the project work. The candidate has to pass all the theory and practical subjects before submission of the Thesis. For the approval of PRC the candidate shall submit the draft copy of thesis to the Head of the Department and shall make an oral presentation before the PRC.

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

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

If the report of the examiner is not favourable, the candidate shall revise and resubmit the Thesis, in the time frame as decided by the PRC. If the report of the examiner is unfavourable 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 College.

If the report of the examiner is favourable, a board consisting of the Supervisor, Head of the Department and the examiner approved by the College who adjudicated the thesis shall conduct Viva-Voce examination. The Board shall jointly report the candidate's work for a maximum of 100 Marks. The Head of the Department shall coordinate and make arrangements for the conduct of Viva-Voce examination. If the report of the Viva-Voce is unsatisfactory (i.e., <50 marks), the candidate shall retake the Viva-Voce examination only after three months. If he fails to get a satisfactory report at the second Viva-Voce examination, the candidate has to re-register for the project and complete the project within the stipulated time after taking the approval from the Institution.

6. MOOC COURSES:

A student shall be permitted to pursue up to a maximum of two elective courses under MOOCs during the programme. Students are advised to register for minimum 12 weeks or more in duration MOOCs courses. Student has to pursue and acquire a certificate for a MOOC course only from the SWAY/NPTEL through online with the approval of Head of the Department in order to earn the credits. The Head of the Department shall appoint a mentor for each of the MOOC subjects registered by the students to monitor the student's assignment submissions given by SWAYAM/NPTEL. The student needs to earn a certificate by passing the exam. The student will be awarded the credits given in curriculum only by submission of the certificate. In case if student does not pass subjects registered through SWAYAM/NPTEL, the same or alternative equivalent subject may be registered again through SWAYAM/NPTEL in the next semester with the recommendation of HOD and shall be passed.

7. METHOD OF AWARDING LETTER GRADES AND GRADE POINTS FOR A COURSE:

A letter grade and grade points will be awarded to a student in each course based on his/her performance as per the grading system given below:

Grading System for MCA Programme

Marks Range	Level	Letter Grade	Grade Points
>= 90%	Outstanding	A+	10
80 – 89%	Excellent	A	9
70 – 79%	Very Good	B	8
60 – 69%	Good	C	7
50 – 59%	Fair	D	6
< 50%	Fail	F	0
-	Absent	AB	0

8. CALCULATION OF SEMESTER GRADE POINTS AVERAGE (SGPA) FOR SEMESTER:

The performance of each student at the end of the each semester is indicated in terms of SGPA.

The SGPA is calculated as below:

$$\text{SGPA} = \frac{\Sigma(\text{CR} \times \text{GP})}{\Sigma\text{CR}}$$ (For all courses passed in a semester)

Where CR = Credits of a Course
GP = Grade points awarded for a course

9. CALCULATION OF CUMULATIVE GRADE POINTS AVERAGE (CGPA) AND AWARD OF DIVISION FOR ENTIRE PROGRAMME:

The CGPA is calculated as below:

$$\text{CGPA} = \frac{\Sigma(\text{CR} \times \text{GP})}{\Sigma\text{CR}}$$ (for the entire programme)

Where CR = Credits of a course
GP = Grade points awarded for a course

Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.
As per the AICTE regulations, conversion of CGPA into equivalent percentage as: Equivalent Percentage = (CGPA – 0.5) x 10

10. AWARD OF CLASS:

Class Awarded	CGPA to be secured	Remarks
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 and < 6.75	

11. SUPPLEMENTARY EXAMINATIONS:

Supplementary examinations will be conducted along with the subsequent batches regular examinations.

12. WITHHOLDING OF RESULTS:

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

13. TRANSITORY REGULATIONS:

Discontinued or detained candidates are eligible for readmission (within the duration as mentioned in item 2 and when next offered.

The readmitted students will be governed by the regulations under which the candidate has beenadmitted.

14. GENERAL:

Wherever the words he/him/his occurs in the regulations, they include she/her/hers.

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

In the case of any doubt or ambiguity in the interpretation of the above rules/regulations, the decision of the Principal is final.

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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DISCIPLINARY ACTION FOR MALPRACTICES/IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
1	If the student 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 student 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.
	If the student gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phone with any student or students in or outside the exam hall with respect to any matter	Expulsion from the examination hall and cancellation of the performance in that subject only. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	If the student 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 student is appearing	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year.
3	If the student impersonates any other student in connection with the examination	The student who has impersonated shall be expelled from examination hall. The student is also debarred and forfeits the seat. The performance of the original student, who has been impersonated, shall be cancelled in all the subjects of the examination (including practical's and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all semester-end examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of the seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4	If the student smuggles the answer book or additional sheet or takes out or arranges to send out the question paper 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 student 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 student is also debarred for two consecutive semesters from class work and all semester-end examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of the seat.
5	If the student uses objectionable, abusive or offensive language in the answer script 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	If the student refuses to obey the orders of the Chief Superintendent/Assistant -Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a	In case of students of the college, they shall be expelled from examination hall and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already

	walkout or instigates others to walk out or threatens the officer-in charge or any person on duty in or outside the examination hall or causes any injury to any of his relatives either by words 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 relatives, or indulges in any other act of misconduct or mischief which results in damage 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	appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The students 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	If the student leaves the exam hall taking away answer script or intentionally tears off 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 student 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 student 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 the seat.
8	If the student possesses 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 student 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 student 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 clauses 6, 7, 8	In case of student of the college, expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student 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	If the student 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 student 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 student has already appeared including practical examinations and project work of that semester/year examinations.

Master of Computer Applications

Course Structure & Syllabus

MCA

Course Structure

I Semester

S. No	Course Code	Course Name	L	T	P	Credits
1	24MCA1001	Business Communication	2	0	0	2
2	24MCA1002	Probability and Statistics	3	0	0	3
3	24MCA1003	Computer Organization	3	0	0	3
4	24MCA1004	Operating Systems	3	0	0	3
5	24MCA1005	Data Structures	3	0	0	3
6	24MCA1006	Software Engineering	3	0	0	3
7	24MCA1007	Data Structures Using C Lab	0	0	3	1.5
8	24MCA1008	Statistics with R programming Lab	0	0	3	1.5
Total			17	0	6	20

MCA

Course Structure

II Semester

S. No	Course Code	Course Name	L	T	P	Credits
1	24MCA2001	Database Management Systems	3	0	0	3
2	24MCA2002	Computer Networks	3	0	0	3
3	24MCA2003	Object Oriented Programming with JAVA	3	0	0	3
4	24MCA2004	Design and Analysis of Algorithms	3	0	0	3
5		**Elective-I**	3	0	0	3
	24MCA2005	NoSQL Databases				
	24MCA2006	Mobile Application Development				
	24MCA2007	Artificial Intelligence				
	24MCA2008	Computer Vision and Image Processing				
	24MCA2009	MOOC COURSE				
6	24MCA2010	DBMS Lab	0	0	3	1.5
7	24MCA2011	Computer Networks Lab	0	0	3	1.5
8	24MCA2012	JAVA Programming Lab	0	0	3	1.5
9	24MCA2013	Python Programming Lab	0	0	3	1.5
10	24MCA2014	Socially Relevant Project using design thinking	0	0	2	1
Total			15	0	14	22
Internship/industry oriented mini project (6 Weeks) (Mandatory) during summer vacation						

Master of Computer Applications
Course Structure & Syllabus

MCA
Course Structure
III Semester

S. No	Course Code	Course Name	L	T	P	Credits
1	24MCA3001	Machine Learning	3	0	0	3
2	24MCA3002	Cloud Computing	2	0	0	2
3	24MCA3003	Web Technologies	3	0	0	3
4	24MCA3004	Cryptography and Network Security	3	0	0	3
5	 24MCA3005 24MCA3006 24MCA3007 24MCA3008 24MCA3009 24MCA3010	**Elective-II** Soft Computing Software Project Management UNIX Shell Programming Data Warehousing and Data Mining Internet of things MOOC COURSE	3	0	0	3
6	24MCA3011	Machine Learning with Python Lab	0	0	3	1.5
7	24MCA3012	Web Technologies Lab	0	0	3	1.5
8	24MCA3013	Cloud Computing lab	0	0	2	1
9	24MCA3014	Internship (Minimum 6-weeks)	0	0	0	2
		Total	**14**	**0**	**8**	**20**

MCA
Course Structure
IV Semester

S. No	Course Code	Course Name	L	T	P	Credits
1	 24MCA4001 24MCA4002 24MCA4003 24MCA4004 24MCA4005	**Elective-III** Cyber Crime and Law Protection Data Wrangling and Data Visualization Deep Learning Ad-hoc and Sensor Networks MOOC COURSE	3	0	0	3
2	 24MCA4006 24MCA4007 24MCA4008 24MCA4009 24MCA4010	**Elective-IV** Network Programming Block Chain technologies Software Testing Methodologies Big Data Analytics MOOC COURSE	3	0	0	3
3	24MCA4011	Project Work/ Dissertation	6	0	0	12
		Total	**6**	**0**	**0**	**18**

MCA I Year I Semester

Business Communication

L	T	P	C
2	0	0	2

Subject Code: 24MCA1001

Course Objectives:

To acquaint the students with fundamentals of communication, help them honing oral, written and non-verbal communication skills and to transform them as effective communicators.

Course Outcomes:

By the end of the course students should be able to:

1. Apply business communication theory to solve workplace communication issues.
2. Demonstrate the communication skills required in the workplace.
3. Understand complex ideas in written and spoken formats.
4. Express complex ideas accurately in written and spoken formats.
5. Manage resources effectively and efficiently in an academic context.

Unit - 1:

Purpose and process of communication: Objectives of Communication-Process of Communication- Types of communication; noise, listening skills, Types of listening, essentials of good listening and tips.

Unit – 2

Managing Organizational Communication: Formal and Informal Communication- Interpersonal and Intrapersonal communication- Role of Emotion in Interpersonal Communication- Barriers to Interpersonal Communication- Exchange Theory-Gateways for Effective Interpersonal Communication.

Unit – 3

Non-verbal communication and Body Language: Kinesics, Proxemics, Paralanguage, Haptics, handshakes, appropriate body language and mannerisms for interviews: business etiquettes- across different cultures**.**

Unit – 4

Written communication: mechanics of writing, report writing- business correspondence-business letter format- Meetings and managing meetings- Resume writing-Formats and Skills.

Unit – 5

Presentation skills: prerequisites of effective presentation, format of presentation; Assertiveness – strategies of assertive behavior; Communication skills for group discussion and interviews, Interview Techniques.

Note: Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

Textbooks:

1. Mallika Nawal: “Business Communication”, Cengage Learning, New Delhi, 2012.
2. Edwin A. Gerloff, Jerry C. Wofford, Robert Cummins Organizational Communication: The key stone to managerial effectiveness.
3. Meenakshi Rama: “Business Communication”, Oxford University Press, New Delhi
4. C.S.G. Krishnamacharyulu and Dr. Lalitha Ramakrishnan, Business Communication, Himalaya Publishing House, Mumbai

Reference Books:

1. Paul Turner: “Organisational Communication”, JAICO Publishing House, New Delhi.
2. Sathya Swaroop Debasish, Bhagaban Das” “Business Communication”, PHI Private Limited, New Delhi, 2009.
3. R.K.Madhukar: "Business Communication", Vikas Publishing House, New Delhi,2012.
4. Kelly M Quintanilla, Shawn T.Wahl: "Business and Professional Communication", SAGE, New Delhi,2012.
5. Sangita Mehta, Neety Kaushish: “Business Communication”, University Science Press, New Delhi,2010.
6. Anjali Ghanekar: "Business Communication Skills", Everest Publishing House, NewDelhi,2011

NPTEL Link:

1. https://onlinecourses.swayam2.ac.in/imb24_mg54/preview

MCA I Year I Semester

Probability and Statistics

L	T	P	C
3	0	0	3

Subject Code: 24MCA1002

Course Objectives:

- To provide an understanding of the basic concepts in probability theory and random variables.
- To explore the students will learn the fundamental theory of probability distributions of random variables.
- To provide an understanding the basic theory and techniques of parameter estimation and tests of hypotheses.
- To perform simple statistical analyses for small samples and multivariate techniques.
- To introduce the concept of statistical quality control and Queuing theory.

Course Outcomes:

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

1. Obtain the probability of a random variable following Binomial, Poisson distributions and Negative Binomial distributions.
2. Obtain the probability of a random variable Uniform, Exponential and Normal distributions.
3. Provide and understanding estimate the parameters using point estimation and interval estimation and perform the large sample tests.
4. Perform the small sample tests - t- test, F-test, Chi-Square and analyze ANOVA for the given data and also determine correlation and regression coefficients for given data.
5. Explain basic concepts in Statistical quality control and queuing systems.

Unit – 1

Probability - Definitions of probability, Addition theorem, Conditional probability, Multiplication theorem, Baye's theorem of probability. Random variables and their properties - Discrete random variable, Continuous random variable probability distribution functions and their properties, Mathematical expectations, Probability generating functions.

Unit – 2

Probability Distributions - Discrete distributions- Binomial, Poisson Negative Binominal distributions and their Properties; Continuous distributions - Uniform, Normal, Exponential distributions and their properties.

Unit – 3

Estimation - Sample, Populations, Statistic, Parameter, Sampling distribution, Standard error, criteria of good estimator and Interval estimation. Testing of Hypothesis- Formulation of Null hypothesis, critical region, level of significance, power of the test, Tests of means and proportions in Large Sample tests.

Unit – 4

Small Sample Tests - Testing equality of means, testing equality of variances, Analysis of Variance (ANOVA). Multivariate Analysis – Correlation, Rank Correlation, Simple regression, Multiple regression, Attributes, Coefficient of Association, test of correlation coefficient and regression coefficient, Chi Square test for Goodness of fit and Independence of attributes.

Unit – 5

Statistical Quality Control methods - Methods for preparing control charts, Problems using x-bar, p, R charts and attribute charts. Queuing Theory - Pure Birth and Death Process M/M/1 Model and Simple Problems.

Text Books:

1. Probability & Statistics for Engineers and Scientists,Walpole, Myers, Myers, Ye. Pearson Education.
2. Probability, Statistics and Random Processes T.Veerarajan Tata McGraw – Hill.

Reference Books:

1. Probability & Statistics with Reliability, Queuing and Computer Applications, Kishor S. Trivedi, Prentice Hall of India ,1999.
2. Probability and Statistics, D. K. Murugeson & P. Guru Swamy, Anuradha Publishers.

NPTEL Link:

1. https://nptel.ac.in/courses/106104073

MCA I Year I Semester

Computer Organization

L	T	P	C
3	0	0	3

Subject Code: 24MCA1003

Course Objectives:

- This course is intended to teach the Basic Structure Of Computers
- This includes the concepts Addressing Modes and Component of Instructions
- This course will also expose students to Arithmetic and Logic Instructions
- This includes the concepts Input/output Organization and different buses
- This includes the concepts of Memory Systems and microprogrammed control

Course Outcomes:

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

1. Understanding functional units, operations, buses, software, performance, and computer history, students gain a foundation in computer architecture.
2. Analyze the fundamental mechanisms for data transfer (input/output) and the building blocks of machine instructions.
3. Demystify the language of computers: Explore the diverse instruction types and how they interact with data using addressing modes.
4. Explore how different buses impact data transfer speeds within the system
5. Classify and design different memory organization and Illustrate data transfer between central computer and I/O devices

UNIT - 1:

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

UNIT - 2:

Machine Instruction and Programs: Instruction and Instruction Sequencing: Register Transfer Notation, Assembly Language Notation, Basic Instruction Types, Basic Input/output Operations, The role of Stacks and Queues in computer programming equation. Component of Instructions: Logic Instructions, shift and Rotate Instructions

UNIT - 3:

Type of Instructions:
Arithmetic and Logic Instructions: Increment, decrement, add, subtract, multiply, divide, add with carry, subtract with borrow, negate(2‟scompliment),AND,OR,XOR,
Branch Instructions & Addressing Modes: Implied, Immediate, Register, Register, Indirect, Auto increment and Auto decrement, Direct address, Indirect Address, Relative Address, Indexed ,Base Register addressing modes.

UNIT - 4:

INPUT/OUTPUT ORGANIZATION: Accessing I/O Devices, Interrupts: Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access.
Buses: Synchronous Bus, Asynchronous Bus, Interface Circuits, Standard I/O Interface: Peripheral Component Interconnect (PCI) Bus, Universal Serial Bus (USB)

UNIT - 5:

Memory system: Memory Hierarchy, Semiconductor Memories, RAM(Random Access Memory), Read Only Memory (ROM), Types of ROM, Cache Memory, Performance considerations, Virtual memory, Paging. Input output: I/O interface, Programmed IO, Memory Mapped IO, Interrupt Driven IO, DMA.

Text Books:

1. Computer Organization, Carl Hamacher, Zvonks Vranesic, Safea Zaky, 5th Edition, McGraw Hill.
2. Computer Architecture and Organization, John P. Hayes ,3rd Edition, McGraw Hill.
3. Computer System Architecture, M. Morris Mano, Rajib Mall,3/e

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 or Computer Organization and Design, - Sivaraama Dandamudi Springer Int. Edition.

NPTEL Link:

1. https://nptel.ac.in/courses/106104073

MCA I Year I Semester

Operating Systems

Subject Code: 24MCA1004

L	T	P	C
3	0	0	3

Course Objectives:

- Introduce to the internal operation of modern operating systems
- Define, explain, processes and threads, mutual exclusion, CPU scheduling, deadlock, memory management, and file systems
- To understand the concepts and implementation Memory management policies and virtual memory
- To understand the working of an OS as a resource manager, file system manager, process manager, memory manager and I/O manager and methods used to implement the different parts of OS
- Analyze Security and Protection Mechanism in Operating System

Course Outcomes:

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

1. Identify the various generations of operating system and understood the core functionalities of operating system
2. Gain knowledge on process, thread, schedulers, scheduling algorithm, IPC, Synchronization techniques
3. Analyze different memory management techniques
4. Discuss various file system access methods and file system allocation methods
5. Evaluate Deadlocks problems and Disk Scheduling Algorithms

UNIT – 1:

Operating System structures: Overview of Operating System, Operating systems services, types of operating systems, system calls, types of system calls.
Process Management: Process concept, process scheduling, operations on processes, scheduling criteria, scheduling algorithms, and their evaluation.

UNIT - 2:

Threads: Overview, Multithreading Models, Thread Libraries, Java Threads, Threading Issues, OS Examples
CPU Scheduling: Basic concepts, Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling, Thread Scheduling, Operating system Examples
Process Synchronization: The Critical- section problem, Petersons solution, Synchronization Hardware, Semaphores, Classic problems of Synchronization, Monitors, Atomic Transactions.

UNIT - 3:

Memory management: Main memory: Swapping, Contiguous memory Allocation, Paging, Structure of the Page table, Segmentation
Virtual memory: Background, Demand paging, copy- on-Write, Page Replacement, Allocation of frames, Thrashing, Memory-Mapped Files.

UNIT - 4:

File-system Interface: Concept, Access Methods, Directory structure, File system Mounting, File sharing, Protection
File-system Implementation: File system structure, file system implementation, directory implementation, allocation methods: contiguous allocation, linked allocation and indexed allocation, free-space management.

UNIT - 5:

Deadlocks: System model, deadlock characterization, deadlock prevention, deadlock detection, deadlock avoidance, recovery form deadlock
Mass-storage structure: Overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling, block and character devices.

Text Books:

1. Operating system concepts, 7/e, Abraham Siliberschatz, Galvin, John Wiley &sons, Inc.
2. Operating systems, 6/E, William stallings, PHI/Pearson.
3. Operating systems, 2/e, Dhamdhere, TMH.

Reference Books:

1. Operating systems 3/e, Dietal, Dietal, Pearson.
2. An introduction to Operating systems, Concepts and practice, Pramod Chandra P. Bhat, PHI,5/e
3. Operating systems, Elmasri, Carrick, Levine,TMH,3/e
4. Operating systems, 3/e ,Nutt, Chaki, NeogyPearson.
5. Operating systems, Brian L. Stuart, Cengage.2009
6. Operating systems, Haldar, Aravind, Pearson,2/e.
7. Operating systems, PAL Choudhury, PHI.3/e
8. Operating systems: design and Implementation, 3/e,Tanenbaum, Woodhull.

NPTEL Link:

1. https://nptel.ac.in/courses/106/105/106105214/

MCA I Year I Semester

Data Structures

L	T	P	C
3	0	0	3

Subject Code: 24MCA1005

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:

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

1. Implement basic programs by using C concepts.
2. Understanding Functions, Structures, Unions, Pointers, and File Handling in C for efficient memory management and data manipulation.
3. Select the data structures that efficiently model the information in a problem and Demonstrate the advantages of dynamic memory allocation via linked lists
4. Illustrate the applications of Stacks and Queues.
5. Implement and know the application of algorithms for sorting and nonlinear data structures trees

UNIT - 1:

Introduction to C: Variables and Data Types, Operators and Expressions, Managing Input and Output operators, Decision making-branching and looping, Arrays. Functions, Structures and Unions, Pointers.

UNIT - 2:

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 .

Linked list: singly linked list, Double linked list and circular linked list - implementation, insertion, deletion and searching operations on linear list.

UNIT - 3:

Stacks-Operations, array and linked representations of stacks, stack applications.

Queues- operations, array and linked list representations.

UNIT - 4:

Sorting Techniques: Insertion sort, selection sort, exchange-bubble sort, quick sort and merge sort Algorithms.

UNIT - 5:

Trees: Binary Trees, terminology, representation and traversals- pre, post & in order traversals.
Search Trees: Binary Search Trees, B-Trees, B+ Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion.

Text Books:

1. Let Us C: Authentic Guide to C Programming Language, 17th ed., Yashavant Kanetkar, BPB Publications.
2. Data Structures Using C. 2nd Edition, Reema Thareja, Oxford
3. Data Structures and Algorithm Analysis in C, 2nded, Mark Allen Weiss

Reference Books:

1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilbergand B.A. Forouzan, Cengage Learning.
2. Programming in ANSI C, 5thed, E. Balaguruswamy, TMH

NPTEL Link:

1. https://nptel.ac.in/courses/106103069

MCA I Year I Semester

Software Engineering

L	T	P	C
3	0	0	3

Subject Code: 24MCA1006

Course Objectives:

- To provide the idea of decomposing the given problem into Analysis, Desing, Implementation, Testing and Maintenance phases.
- To provide an idea of using various process models in the software industry according to given circumstances.
- To gain the knowledge of how Analysis, Design, Implementation, Testing and Maintenance processes are conducted in a software project.

Course Outcomes:

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

1. Identify and analyze the evolving role of software in various domains, understand the changing nature of software development
2. Apply the appropriate process models for the application development of SDLC.
3. Analyze a problem, identify and define the user and system requirements and assist in the creation of effective project plan.
4. Design a software system and its process to meet user needs.
5. Analyzing the strategies for coding and testing phase in software product development.

UNIT - 1:

Introduction to Software Engineering:

The evolving role of software, Changing Nature of Software, Software myths.

The software problem: Cost, schedule and quality, Scale and change.

UNIT - 2:

Software Process:

Process and project, component software process, Software development process models : Waterfall model, prototyping, iterative development, relational unified process, time boxing model, Extreme programming and agile process, using process models in a project. Project management process.

UNIT - 3:

Software requirement analysis and specification: Value of good SRS, requirement process, requirement specification, functional specifications with use-cases, other approaches for analysis, validation.

Planning a software project: Effort estimation, project schedule and staffing, quality planning, risk management planning, project monitoring plan, detailed scheduling.

UNIT - 4:

Software Architecture: Role of software architecture, architecture views, components and connector view, architecture styles for C & C view, documenting architecture design, evaluating architectures.

Design: Design concepts, function-oriented design, object oriented design, detailed design, verification, metrics.

UNIT - 5:

Coding and Unit testing: Programming principles and guidelines, incrementally developing code, managing evolving code, unit testing, Integration testing, code inspection, metrics.

Testing: Testing concepts, testing process, black-box testing, white-box testing, metrics.

Text Books:

1. A Concise introduction to software engineering (undergraduate topics in computer science), Pankaj Jalote, Springer International Edition.
2. Software Engineering, APrecise approach, Pankaj Jalote,Wiley,2010
3. Software Engineering, 3/e, & 7e Roger S.Pressman, TMH
4. Fundamentals of software Engineering,RajibMall,PHI,2/e

Reference Books:

1. Software Engineering, 8/e, Sommerville, Pearson.
2. Software Engineering principles and practice, W S Jawadekar,TMH,7/e
3. Software Engineering concepts, RFairley,TMH,1997

NPTEL Link:

1. http://nptel.ac.in/courses/106101061/

MCA I Year I Semester

Data Structures using C Lab

L	T	P	C
0	0	3	1.5

Subject Code: 24MCA1007

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 (COs):

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

1. Implement various basic data structures and its operations.
2. Apply sorting and searching algorithms to given numbers
3. Implement various tree operations.
4. Implement various graphs algorithms.
5. Develop applications using various data structures.

Experiment 1:

a. Write a program in C to display the n terms of even natural numbers and their sum.
b. Write a C program to check whether a given number is an Armstrong number or not.
c. Write a C program to calculate the factorial of a given number.

Experiment 2:

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

Experiment 3:

a. Write a program in C to check whether a number is a prime or not using the function.
b. Write recursive program which computes the nth Fibonacci number, for appropriate values of n.

Experiment 4:

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)

Experiment 5:

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

Experiment 6:

a. Write C program that implement stack (its operations) using arrays.
b. Write C program that implement stack (its operations) using Linked list.

Experiment 7:

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

Experiment 8:

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

Experiment 9:

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

Experiment 10:

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

Experiment 11:

a. Implementation of Binary Search trees- Insertion and deletion.

Experiment 12:

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

Text Books:

1. Let Us C: Authentic Guide to C Programming Language, 17th ed., Yashavant Kanetkar, BPB Publications.
2. Data Structures Using C. 2nd Edition, Reema Thareja, Oxford
3. Data Structures and Algorithm Analysis in C, 2nded, Mark Allen Weiss

Reference Books:

1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilbergand B.A. Forouzan, Cengage Learning.
2. Programming in ANSI C, 5thed, E. Balaguruswamy, TMH

MCA I Year I Semester

Statistics with R programming Lab

L	T	P	C
0	0	3	1.5

Subject Code: 24MCA1008

Course Objectives:

- To introduce basic R operations and determine the probabilities of a random variable using Binomial, Poisson's, Normal distribution.
- To determine the probabilities of sample mean using central limit theorem and to estimate confidence interval using R programming.
- To perform z-test for sampling distribution using R - programming.
- To analyse t-test and F-test for sampling distribution using R - programming.
- perform -test and Analysis of variance (ANOVA) using R - programming.
- To calculate correlation and regression for given data using R programming.

Course Outcomes (COs):

On completion of this course, students will be able to

1. Obtain probabilities of random variable of a Binomial, Poisson's, Normal distribution using R programming.
2. Calculate probabilities of sample mean and confidence interval using R - programming.
3. Perform z – test, t – test and F-test for sampling distributions using R programming.
4. Analyse tests of significance using χ^2-test and ANOVA using R programming.
5. Determine the coefficient of correlation and regression equations for given data using R programming.

Students able to perform statistical calculations and hypothesis tests using R such as T-Tests , F-Tests, Chi-Square Tests, Analysis of Variance (ANOVA), Correlation and Regression Analysis.

Sample Experiments

1. Write the commands on R console to calculate the probability of an events and random variables.
2. Write the commands on R console to calculate the probability of random variable for Binomial, Poisson and Negative Binomial distributions.
3. Write the commands on R console to calculate the probability of random variable for Uniform, Exponential distribution.
4. Write the commands of R console to calculate the probability of random variable for Normal distribution
5. Write the commands on R console to calculate the confidence interval for mean and proportions also perform z-test for means and proportions.
6. Write the commands on R console to perform t-test means and F-test for equality of population variances at α level of significance.
7. Write the commands on R console to perform χ^2-test for testing the goodness of fit and independence of attributes.

8. Write the commands on R console to perform ANOVA of one way and two way classifications to test on the basis of sample observations whether the means of 3 or more populations are equal or not.
9. Write the commands on R console to perform Correlation and simple regression and multiple regressions for given data.

MCA I Year II Semester

Database Management Systems

Subject Code: 24MCA2001

L	T	P	C
3	0	0	3

Course Objectives:

This Course will enable students to

- Explain the concept of databases, 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 (COs):

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

1. Illustrate the concept of databases, database management systems, database languages, database structures and their work
2. Apply ER modeling and Relational modeling for designing simple databases.
3. Summarize the concepts related to relational model and SQL and Write database queries using relational algebra and structured query language.
4. Design and develop databases from the real world by applying the concepts of Normalization.
5. Outline the issues associated with Transaction Management and Recovery, Tree Structured and Hash-Based Indexing

UNIT - 1:

Introduction to Databases: Introduction, An Example, Characteristics of the Database Approach, Actors on Scene, Workers behind the scene, Advantages of Using the DBMS Approach, A Brief History of Database Applications, When Not to Use a DBMS

Overview of Database Languages and Architectures: Data Models, Schemas and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces, The Database System Environment, Centralized and Client/Server Architecture for DBMSs, Classification of Database Management Systems

UNIT - 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

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

UNIT - 3:

Relational Algebra: Selection and Projection, Set Operations, Renaming, Joins, Division, More Examples of Algebra Queries.

SQL: Queries, Constraints, Triggers: The Form of a Basic SQL Query, UNION, INTERSECT, EXCEPT and WITH, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers and Active Databases, Designing Active Databases.

UNIT - 4:

Introduction to Normalization Using Functional and Multivalued Dependencies: In formal Design Guidelines for Relation Schema, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form.

UNIT - 5:

Transaction Management and Concurrency Control: Transaction Concept, A Simple Transaction Model, Storage Structure, ACID Properties, Serializability, Transaction Isolation Levels, Concurrency Control, Lock-Based Protocols, Validation-Based Protocols

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, Mc Graw-Hill
3. Database Systems, 6/e Ramez Elmasri, Shamkant B. Navathe, Pearson

Reference Books:

1. DatabaseSystems,9/e, Carlos Coronel, Steven Morris, Peter Rob, Cengage
2. Introduction to Database Systems, 8/e, C J Date, Pearson

NPTEL Link:

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

MCA I Year II Semester

Computer Networks

L	T	P	C
3	0	0	3

Subject Code: 24MCA2002

Course Objectives:

This Course will enable students to

- Explain Data Communications System and its components, different types of network topologies and protocols.
- Demonstrate different layers of ISO and TCP/IP models and illuminate its function.
- Apply knowledge of different techniques of error detection and correction to detect and solve error bit during data transmission.
- Analyse main protocols such as HTTP, FTP, SMTP, TCP, UDP, IP.

Course Outcomes (COs):

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

1. Identify and enumerate different types of network topologies, protocols and the layers of the OSI and TCP/IP models and explain the functions of each layer.
2. Explain the protocols of Data Link Layer and illustrate how a network can detect and correct transmission errors.
3. Classify, compare and analyze the major routing algorithms and distinguish congestion control algorithms and understand how a packet is routed over the internet.
4. Describe how TCP and UDP function, its uses and summarize the differences between them.
5. Analyze the features and operations of various Application layer protocols such as http, DNS, and SMTP.

UNIT - 1

Introduction: Data Communication, Components, Data Representation, Data Flow; Networks: Physical Structures, Categories of Network, Interconnection of Networks; The OSI models: Layered architecture, peer-to-peer process, Encapsulation, Layers in OSI model, TCP/IP protocol suite, Addressing: Physical Address, Logical Address, Port Address, Specific Address.

UNIT - 2:

Data Link Layer: Design Issues, Services Provided to Network Layer, Framing, Error Control and Flow Control, Elementary Data Link Protocols, Sliding Window Protocols.

UNIT - 3:

The Network Layer: Network Layer Design Issues-Services: Provided to Transport Layer, Implementation of Connection Less Service, Implementation of Connection Oriented Service, Routing Algorithms: Shortest Path Routing, Distance Vector Routing, Link State Routing, Congestion Control Algorithms: General Principles of Congestion Control, Congestion Prevention Policies, The Network Layer in Internet-The IP Protocol, IP Address-IPV4, IPV6.

UNIT - 4:

The Transport Layer: Connectionless verses Connection Oriented Services, UDP: Well-known Ports for UDP, User Datagram, Checksum, UDP Operations and Uses of UDP; TCP: TCP Services, TCP Features, TCP Segment, a TCP Connection- Connection Establishment, Data Transmission, Connection Termination.

UNIT - 5:

The Application Layer: DNS- Domain Name System- The DNS Name Space, Resource Records, Name Servers, Electronic Mail- Architecture and Services, The User Agent, Message Format, Message Transfer, Final Delivery, The World Wide Web- Architectural Overview, Static Web Document, Dynamic Web Document; Hyper Text Transfer Protocol (HTTP).

Text Books:

1. Computer Networks: Andrew S Tanenbaum David J. Wetherall, 5/e, Pearson
2. Data communications and networking: Behrouz Forouzan, 5/e, McGraw Hill
3. Data and computer Communications, William Stallings,PEARSON,10/e

Reference Books:

1. An Engineering approach to computer Networking, S Keshav, 2nd Edition, Pearson Education.
2. Computer Networking a Top-Down approach featuring the internet, J.F.Kurose, K.W.Ross, 2nd Edition, Pearson Education.

NPTEL Link:

1. https://nptel.ac.in/courses/106105081

MCA I Year II Semester

Object Oriented Programming using JAVA

Subject Code: 24MCA2003

L	T	P	C
3	0	0	3

Course Objectives:

This Course will enable students to

1. The objective of the course is to teach the basic concepts and techniques which form the object oriented programming paradigm
2. Well equipped with Java SDK environment to create, debug and run simple Java programs

Course Outcomes (COs):

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

1. Developing to Write Simple Java Programs
2. Understanding Object-Oriented Principles
3. Implementation of Inheritance and Polymorphism
4. Illustrate different techniques on creating and accessing packages
5. Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes

UNIT - 1:

Introduction To Java: Evolution of Java, Java Buzzwords, The Java Virtual Machine, An overview of Java- Simple Java Program, Naming Conventions in Java, Data types, Variables, Expressions, Automatic type Conversion, Operators, Control Statements , Arrays, Strings

UNIT - 2:

Classes & Objects: Class fundamentals, Declaring Objects, Initializing the instance variables, Access Control, Constructors, Methods in Java, Overloading Methods and constructors, Static Methods, Recursion, final keyword, this keyword, garbage collection, finalize() method

UNIT - 3:

Inheritance: Inheritance Basics, Types of Inheritance, The Keyword 'super', Final with inheritance. Polymorphism: Method Overriding, Dynamic Method Dispatch, Abstract Classes.

UNIT - 4:

Interfaces: Interface, Multiple Inheritance using Interface, Abstract Classes vs. Interfaces Packages: Packages, Different Types of Packages, Access Protection, Importing Packages.

UNIT - 5:

Exception Handling: Exception-handling fundamentals, throw Clause, throws Clause.

Types of Exceptions: Built-in Exception, User Defined Exception.

Threads: Java Thread Model, Main Thread, Creating a Thread and Running it, terminating the Thread, Creating Multiple Threads, Thread Synchronization, and Thread Priorities.

Text Books:

1. Herbert Schildt, "Java The complete reference", 12th Edition, McGraw-Hill, 2022.

2. Timothy budd, "An introduction to object-oriented programming", 3rd Edition, Pearson Education, 2009.

Reference Books:

1. E. Balaguruswamy, "Programming with Java A Primer", 5th Edition, Tata McGraw-Hill, 2017.
2. Y. Daniel Liang, "Introduction to Java programming", 9thEdition, Pearson education, 2015.
3.

NPTEL Link:

1. https://nptel.ac.in/courses/106105191

MCA I Year II Semester

Design and Analysis of Algorithms

L	T	P	C
3	0	0	3

Subject Code: 24MCA2004

Course Objectives:

This Course will enable students to

- To provide an introduction to formalisms to understand, analyze and denote time complexities of algorithms
- To introduce the different algorithmic approaches for problem solving through numerous example problems
- To provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness

Course Outcomes (COs):

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

1. Analyze and evaluate the efficiency of algorithms using various performance metrics
2. Able to analyze and implement divide-and-conquer and greedy algorithms to solve complex problems.
3. Apply dynamic programming techniques to solve complex optimization problems s
4. Able to apply the backtracking method to solve complex combinatorial problems
5. Demonstrate an understanding of NP- Completeness theory and lower bound theory

UNIT - 1:

Introduction: Algorithm, Pseudocode for expressing algorithms, performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Little oh notation, probabilistic analysis, Amortized analysis.

UNIT – 2:

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, Minimum cost spanning trees, Single source shortest path problem, knapsack problem.

UNIT - 3:

Dynamic Programming: General method, applications-Matrix chain multiplication, Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem.

UNIT - 4:

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

UNIT - 5:

Branch and Bound: General method, applications - Travelling sales person 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.

Text Books:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharam, UniversitiesPress,2/e
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.Rivestand C.Stein, PHI Pvt.Ltd

Reference Books:

1. Introduction to the Design and Analysis of Algorithms, Anany Levitin, PEA,3/e
2. Design and Analysis of Algorithms, Pearson Education, Parag Himanshu Dave, HimansuBalachandraDave,2/e
3. Introduction to Design and Analysis of Algorithms A strategic approach, R.C.T. Lee, S.S.Tseng, R.C.Chang and T.Tsai, McGrawHill.2005
4. Design and Analysis of algorithms, Pearson education, Aho, Ullmanand Hopcrof t,1/e

NPTEL Link:

1. https://nptel.ac.in/courses/106101059

MCA I Year II Semester

Elective - I

NoSQL Databases

Subject Code: 24MCA2005

L	T	P	C
3	0	0	3

Course Objectives:

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

- Define, compare and use the four types of NoSQL Databases (Document- oriented, Key Value Pairs, Column oriented and Graph)
- Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases
- Explain the detailed architecture, define objects, load data, query data and performance tune Document oriented NoSQL databases
- Ability to design entity relationship model and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data

Course Outcomes (COs):

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

1. Identify what type of NoSQL database to implement based on business requirements (key-value, document, full text, graph, etc.)
2. Apply NoSQL data modeling from application specific queries
3. To provide an in-depth understanding of various NoSQL storage architectures
4. Use Atomic Aggregates and denormalization as data modelling techniques to optimize query processing.
5. Understand and apply indexing and ordering techniques to optimize data retrieval in MongoDB, CouchDB, and Apache Cassandra.

UNIT - 1:

Introduction to NoSQL: Definition And Introduction, Sorted Ordered Column- Oriented Stores, Key/Value Stores, Document Databases, Graph Databases, Examining Two Simple Examples, Location Preferences Store, Car Make And Model Database, Working With Language Bindings.

UNIT - 2:

Interacting with NoSQL: If NoSql Then What, Language Bindings For NoSQL Data Stores, Performing Crud Operations, Creating Records, Accessing Data, Updating And Deleting Data

UNIT - 3:

NoSQL Storage Architecture: Working With Column-Oriented Databases, Hbase Distributed Storage Architecture, Document Store Internals, Understanding Key/Value Stores In Memcached And Redis, Eventually Consistent Non-Relational Databases.

UNIT - 4:

NoSQL Stores: Similarities Between Sql And Mongodb Query Features, Accessing Data From Column-Oriented Databases Like Hbase, Querying Redis Data Stores, Changing Document Databases, Schema Evolution In Column- Oriented Databases, Hbase Data Import And Export, Data Evolution In Key/Value Stores.

UNIT - 5:

Indexing and Ordering Data Sets: Essential Concepts Behind A Database Index, Indexing And Ordering In Mongodb, Creating and Using Indexes In Mongodb, Indexing And Ordering In Couchdb, Indexing In Apache Cassandra.

Text Books:

1. Pramod Sadalage and Martin Fowler, NoSQL Distilled, Addison-Wesley Professional, 2012.
2. Dan McCreary and Ann Kelly, Making Sense of NoSQL, Manning Publications, 2013.

Reference Books:

1. Shashank Tiwari, Professional NoSQL,Wrox Press, Wiley, 2011, ISBN: 978-0-470-942246
2. Gaurav Vaish, Getting Started with NoSQL, Packt Publishing, 2013.

MCA I Year II Semester

Elective - I

MOBILE APPLICATION DEVELOPMENT

Subject Code: 24MCA2006

L	T	P	C
3	0	0	3

Course Objectives:

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

- To demonstrate the introduction and characteristics of mobile applications
- Application models of mobile application frameworks. Managing application data and User-interface design for mobile applications
- Integrating networking, the OS and hardware into mobile-applications
- Addressing enterprise requirements in mobile applications – performance, scalability, modifiability, availability and security
- Testing methodologies for mobile applications– Publishing, deployment, maintenance and management. To demonstrate their skills of using Android software development tools
- To demonstrate their ability to deploy software to mobile devices

Course Outcomes (COs):

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

1. Install and configure Android application development tools
2. Design and develop user Interfaces for the Android platform
3. Save state information across important operating system events
4. Apply Java programming concepts to Android application development
5. comprehensive understanding of power management strategies, the implementation of augmented reality using mobile sensors

UNIT - 1:

Introduction to mobile devices: Introduction to Mobile Computing, Introduction to Android Development Environment, Mobile devices vs. desktop devices, ARM and Intel architectures, Screen resolution, Touch interfaces, Application deployment, App Store, Google Play Store, Windows Store.

Development environments: XCode, Eclipse, Visual Studio, PhoneGAP, etc.; Native vs. web applications.

UNIT - 2:

Android User Interface: Measurements – Device and pixel density independent measuring units User Interface (UI) Components – Editable and non-editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multiscreen Activities.

UNIT - 3:

Back Ground Running Process, Networking and Telephony Services: Services: Introduction to services – local service, remote service and binding the service, the communication between service and activity, Intent Service.

Multi-Threading: Handlers, AsyncTask.

Broad cast receivers: Local Broadcast Manager, Dynamic broadcast receiver, System Broadcast. Pending Intent, Notifications.

UNIT - 4:

Android: Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications

Android network programming: Http URL Connection, Connecting to REST- based and SOAP based Web services.

UNIT - 5:

Advanced Topics: Power Management: Wake locks and assertions, Low-level OS support, Writing power-smart applications.

Augmented Reality via GPS and other sensors: GPS, Accelerometer, Camera. Mobile device 'security in depth: Mobile malware, Device protections, iOS 'Jailbreaking', Android 'rooting' and Windows 'defenestration'; Security and Hacking: Active Transactions, More on Security, Hacking Android

Text Books:

1. Bill Phillips, Chris Stewart, Brian Hardy, and Kristin Marsicano, Android Programming: The Big NerdRanch Guide, Big Nerd Ranch LLC, 2nd edition, 2015.
2. Valentino Lee, Heather Schneider, and Robbie Schell, Mobile Applications: Architecture, Design and Development, Prentice Hall, 2004.
3. ProfessionalAndroid4ApplicationDevelopment,RetoMeier,WileyIndia, (Wrox) , 2012
4. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

Reference Books:

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013
2. Tomasz Nurkiewicz and Ben Christensen, Reactive Programming with RxJava, O"Reilly Media, 2016.
3. Brian Fling, Mobile Design and Development, O"Reilly Media, Inc., 2009.

NPTEL Link:

1. https://onlinecourses.swayam2.ac.in/nou24_ge25/preview

MCA I Year II Semester

Elective - I

ARTIFICIAL INTELLIGENCE

Subject Code: 24MCA2007

L	T	P	C
3	0	0	3

Course Objectives:

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

- To have a basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language
- To have an understanding of the basic issues of knowledge representation and blind and heuristic search, as well as an understanding of other topics such as minimax, resolution that play an important role in AI programs
- To have a basic understanding of some of the more advanced topics of AI

Course Outcomes (COs):

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

1. Outline problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem
2. Apply the language/framework of different AI methods for a given problem
3. Implement basic AI algorithms
4. Design and carry out an empirical evaluation of different algorithms on problem formalization
5. State the conclusions that the evaluation supports

UNIT - 1:

Introduction: History, intelligent systems, foundations of AI, applications, tic- tac-toe game playing, development of AI languages, current trends.

UNIT - 2:

Problem Solving: Solving Problems by Searching- Search Strategies: State-space problem, Problem Solving by Intelligent search: BFS, DFS, Iterative Deepening Search, Hill Climbing, Simulated Annealing, heuristic Search: A*, AO* Algorithms.

UNIT - 3:

Logic concepts: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic.

UNIT - 4:

Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames Advanced knowledge representation techniques: Introduction, conceptual dependency theory, script structure, CYC theory, case grammars, semantic web.

UNIT - 5:

Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems

Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions, multi valued logic, fuzzy logic, linguistic variables and hedges, fuzzy propositions, Inference rules for fuzzy propositions, fuzzy systems.

Text Books:

1. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning.
2. Artificial intelligence, A modern Approach, 2nded, Stuart Russel, Peter Norvig, PEA.

Reference Books:

1. Artificial Intelligence- Deepak Khemani, TMH,2013.
2. Introduction to Artificial Intelligence, Patterson,PHI.
3. Artificial intelligence, structures and Strategies for Complex problem solving, George FLugar, 5th ed,PEA

NPTEL Link:

1. https://nptel.ac.in/courses/106102220

MCA I Year II Semester

Elective - I

Computer Vision and Image Processing

L	T	P	C
3	0	0	3

Subject Code: 24MCA2008

Course Objectives:

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

- To study the need for image processing and its fundamentals.
- To study the image enhancement techniques
- To study the image compression procedures.
- To study image restoration procedures.
- To study image segmentation and edge techniques.

Course Outcomes (COs):

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

1. Review the fundamental concepts of a digital image processing system and to learn and understand various image enhancement techniques used in digital image Processing.
2. Understand the need for image compression and learn the techniques of image compression.
3. Grip several Morphological algorithms techniques for image analysis and recognition
4. To learn and understand various image restoration methods and segmentation methods in digital image processing
5. To learn and understand various image color processing techniques and computer vision Processing.

UNIT - 1:

Digital Image Fundamentals: Introduction to Image Processing – Applications of Image Processing, Components in Digital Image Processing. Image Enhancement: Basic Gray level Transformation techniques, Histogram processing, Arithmetic/Logical Operations- Image Subtraction and Image Averaging, Basics of Spatial Filtering Smoothening Spatial Filters.

UNIT - 2:

Image Compression: Redundancy- Coding, Inter Pixel, Psycho-Visual, Fidelity Criteria, Image Compression Fundamentals: Lossless and Lossy Compression, Basic Compression Methods: Huffman Coding, Run-Length Coding, LZW Coding, Arithmetic Coding, Bit-Plane Coding, Standard JPEG Image Compression.

UNIT - 3:

Image Morphology: Basic Concepts of Set Theory, Logical Operations Involving Binary Images, Dilation, and erosion, opening, and closing, The Hit or Miss Transformation, Basic Morphological Algorithms-Boundary Extraction, Region Filling Extraction of Connected Components, Convex Hull, Thinning, Thickening, Skeletons, Pruning.

UNIT - 4:

Image Segmentation: Introduction to Image Segmentation, Detection of discontinuities-point detection, line detection, edge detection, Introduction to Region-based Segmentation, Region growing, Region Splitting, and Region Merging.

UNIT - 5:

Color Image Processing: Color Fundamentals, Color characteristics, Color models, RGB, CYK, CMYK, HIS, YIQ models, Pseudo color image processing, full-color image processing, Computer vision applications, Difference between Image Processing and Computer Vision.

Text Books:

1. Digital Image Processing – R.C. Gonzalez & R.E. Woods, Addison Wesley / Pearson Education, 4th Edition, 2018.
2. Digital Image Processing – S Jayaraman, S Esakkirajan, T Veerakumar, Tata McGraw Hill Education Pvt. Ltd., 5th Edition, 2017.

Reference Books:

1. Digital Image Processing using MATLAB-Rafael C. Gonzalez, Richard E woods and Steven L. Eddins, Tata McGraw Hill, 2018.

NPTEL Link:

1. https://nptel.ac.in/courses/117105135

MCA I Year II Semester

DBMS LAB

L	T	P	C
0	0	3	1.5

Subject Code: 24MCA2010

Course Objectives:

At the end of the course, student will be able 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 (COs):

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

1. Understand different types of SQL and using various commands.
2. Utilize SQL to execute queries for creating database and performing data manipulation operations
3. Examine integrity constraints to build efficient databases
4. Apply Queries using Advanced Concepts of SQL
5. Build PL/SQL programs including stored procedures, functions, cursors and triggers

List of Experiments:

1. Execute all DDL, DML and DCL commands on sample tables.
   Execute single line and group functions on a table.

2. Create tables for various relations in SQL with necessary integrity constraints, keys, data types. Verify messages by violating the constraints.

3. Implementation of different types of joins with suitable examples.
   Execute DCL and TCL Commands.

4. Write a PL/SQL program for accepting a number and indicate whether it is odd or even.
   Implementation of sub queries and nested queries.

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

   Control Structure

6. Write a PL/SQL block for Addition of Two Numbers
   Write a PL/SQL block for IF, IF and else condition.

7. Write a PL/SQL block for implementation of loops
   Write a PL/SQL block for greatest of three numbers using IF AND ELSE IF

Triggers

8. Write a PL/SQL program to accept two numbers N1 and N2 and perform division operation. And also handle the exception "Divide by zero "when N2 is zero.
   Write a PL/SQL program to accept the customer id from the user and display the corresponding customer name and address from customer table. Raise user defined exception "invalid- id" when customer id is <=0 and catch built in exceptions "no data found " and display suitable messages for each exception.

9. Write a PL/SQL program using Cursors to update the salaries of Employees as follows. And also count and display the no. of records have been updated.
   if sal<1000 then update the salary to 1500.
   if sal>=1000 and <2000 then update the salary to 2500.
   if sal>=2000 and <=3000 then update the salary to 4000.
   Write a PL/SQL program using triggers to automatically store all the deleted records from employee table in a separate table called "employees history " along with date of deletion, userid of the person who deleted.

Procedures

10. Write a PL/SQL Procedure for GCD Numbers
    Write a PL/SQL procedure to display all the records of employee table in a neat format.

Functions

11. Write a PL/SQL program to which computes and returns the maximum of two values using a function.
12. Write a PL/SQL block to implement factorial using functions

Text Books:

1. Oracle: The Complete Reference by Oracle Press
2. SQL, PL/SQL the Programming Language of Oracle by Ivan Bayross, BPB Publications, 4th Edition

Reference Books:

1. Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007

MCA I Year II Semester

Computer Networks Lab

L	T	P	C
0	0	3	1.5

Subject Code: 24MCA2011

Course Objectives:

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

- Understands the fundamental concepts of computer networking and OSI Reference model.
- Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- Learn and understand the advanced networking concepts, preparing the student for entry advanced courses in computer networking.
- Develop and gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

Course Outcomes (COs):

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

1. Identify and understand various techniques and modes of transmission
2. Demonstrate the data link protocols, multi-channel access protocols and IEEE 802 standards for LAN
3. Describe routing and congestion in network layer with routing algorithms and classify IPV4 addressing scheme
4. Discuss the elements and protocols of transport layer
5. Develop network security and define various protocols such as FTP, HTTP, Telnet, DNS

List of Experiments:

1. Implementation of different data link framing methods
2. Implementation of error detection techniques
3. Implementation of routing algorithms
4. Implementation of congestion control algorithms
5. Implement the following forms of IPC.
   a. Pipes b. FIFO
6. Simultaneously by two processes. Use semaphores to avoid race conditions
7. Design TCP Client and server application
8. Design UDP Client and server application
9. Implement basic networking commands
10. Design basic protocol header using structure and bit fields concept
11. Design an experiment using CISCO packet tracer

Text Books:

1. Computer Networks: Andrew S Tanenbaum David J. Wetherall, 5/e, Pearson
2. Data communications and networking: Behrouz Forouzan, 5/e, McGraw Hill
3. Data and computer Communications, William Stallings,PEARSON,10/e

Reference Books:

1. Computer Networks –ASystemApproach,Peterson,BruceDavie,2/e, Harcourt Asia
2. Compute communications and networking technologies, Gallo, Hancock, Cengage
3. An Engineering approach to compute networking, Kesha, Pearson

MCA I Year II Semester

JAVA Programming Lab

L	T	P	C
0	0	3	1.5

Subject Code: 24MCA2012

Course Objectives:

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

- To understand how to design, implement, test, debug, and document programs that use basic data types and computation.
- To understand the importance of Classes & objects along with constructors, Arrays and Vectors.
- Discuss the principles of inheritance, interface and packages and demonstrate though problem analysis assignments.
- To understand importance of Multi-threading & different exception handling mechanisms.

Course Outcomes (COs):

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

1. Apply OOP concepts to solve real world problems
2. Implement different forms of inheritance
3. Create packages and to reuse them.
4. Implement multi-threaded programs using synchronization concepts
5. Create user defined exceptions

List of Experiments:

1. Write a Java Program that uses both recursive and non-recursive functions to print the nth value of the Fibonacci sequence.
2. Write a Java Program that prompts the user for an integer and then prints out all the prime numbers up to that Integer.
3. Write a Java Program that checks whether a given string is a palindrome or not. Ex. MALAYALAM is a palindrome.
4. Write a Java Program to implement abstraction and encapsulation.
5. Write a Java Program to implement multiple inheritance.
6. Write a java program to illustrate method overloading and method overriding, covariant sub typing.
7. Writ a java program that illustrates how java achieved Run Time Polymorphism
8. Write a Java Program to create and demonstrate packages.
9. Write a Java program to implement the concept of importing classes from user defined package and creating packages.
10. Write a java program to implement the concept of Exception Handling by using predefined and user defined exceptions.
11. Write a Java Program demonstrating the life cycle of a thread.
12. Write a java program to implement thread priorities

Text Books:

1. Java-The complete reference,7/e, Herbert Schildt,TMH
2. JAVA: How to program, 8/e, Dietal, Dietal, PHI
3. Introduction of programming with JAVA, S.Dean, TMH

Reference Books:

1. Big Java2,3/e, Cay.S. Horstmann, Wiley
2. Introduction to JAVA Programming, 7/e, Y. Daniel Liang, Pearson. , TMH

MCA I Year II Semester

Python Programming Lab

L	T	P	C
0	0	3	1.5

Subject Code: 24MCA2013

Course Objectives:

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

- Learn Syntax and Semantics and create Functions in Python
- Handle Strings and Files in Python
- Understand Lists, Dictionaries and Regular expressions in Python
- Understand use of functions and file handling in python
- Implement Object Oriented Programming concepts and use of Regular expressions and matching in Python

Course Outcomes (COs):

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

1. Examine Python syntax and semantics and be fluent in the use of Python flow control and functions
2. Demonstrate proficiency in handling Strings and File Systems
3. 3Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries.
4. Implement file handling functions and user defined functions in python
5. Interpret the concepts of Object-Oriented Programming as used in Python and to implement Regular Expressions and matching in Python

List of Experiments:

Control Structures:

1. Write the python programs to calculate the following
   a) Find the factorial of given number
   b) To print all the prime numbers below n. n value should be taken from the user at the time of execution
2. Write the python programs to perform the following
   a) To check given number Armstrong or not.
   b) To check Strong number.
   c) To print Fibonacci series.

Sequences:

3. A) Write a Python program to remove the characters which have odd index values of a given string.
   B) Write a Python program to count Uppercase, Lowercase, special character and numeric values in a given string

4. A) Write a Python program to convert a list into a nested dictionary of keys.
   B) Write a python program to remove duplicates from the list

Functions and File Handling

5. Write the python programs to calculate the following
    a) To find HCF or GCD of two numbers
    b) To find sum of natural numbers using recursive function

6. Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order

Modules:

7. Write a python program to define a module to find Fibonacci Numbers and import the module to another program.
8. Write a python program to define a module and import a specific function in that module to another program.

Classes and Regular Expressions

9. Define a class named 'Shape' and its subclass 'Square'. The Square class has an 'init' function which takes a given length as an argument. Both classes have an area function which can print the area of the shape, where Shape's area is 0 by default..

10. Write a Python program to check the validity of a password (input from users).
    (Validation :
    At least 1 letter between [a-z] and 1 letter between [A-Z].
    At least 1 number between [0-9].
    At least 1 character from [$#@].
    Minimum length 6 characters.
    Maximum length 12 characters.)

Text Books:

1. Wesley J .C hun "Core Python Applications Programming", 3rd Edition, 2012, Prentice Hall.
2. Brian jones, David Beazley “Python Cookbook ”, 3rd Edition.

Reference Books:

1. Mark Lutz "Programming Python, 4th Edition" O'Reilly Media.
2. Think Python, Allen Downey, Green Tea Press

MCA II Year I Semester

Machine Learning

L	T	P	C
3	0	0	3

Subject Code: 24MCA3001

Course Objectives:

1. Understand the fundamentals of Machine Learning and its real-world applications.
2. Explore various learning paradigms, including supervised, unsupervised, and reinforcement learning.
3. Develop skills to implement machine learning algorithms and assess their performance.
4. Gain proficiency in statistical learning techniques and optimization methods.
5. Learn advanced topics such as neural networks, support vector machines, and decision trees.

Course Outcomes:

By the end of the course students should be able to:

1. Acquire domain knowledge and apply machine learning techniques to diverse datasets.
2. Implement and analyze supervised and computational learning models.
3. Utilize statistical methods for data-driven decision-making and predictive modeling.
4. Design and evaluate classification models using SVMs, perceptrons, and regression techniques.
5. Construct and optimize multilayer neural networks and decision trees for classification tasks.

Unit-I: Introduction to Machine Learning

Intelligent machines, well-posed problems, applications in diverse fields, data representation, structured and unstructured data, forms of learning, machine learning vs. data mining, basics of linear algebra in machine learning.

Unit-II: Supervised and Unsupervised Learning

Introduction to Supervised and Unsupervised learning, learning from observations, bias in learning, computational learning theory, Occam's Razor principle, overfitting avoidance, heuristic search in inductive learning, estimating generalization errors, performance metrics for classification and regression.

Unit-III: Statistical Learning and Regression

Inferential statistics in machine learning, descriptive statistics, Bayesian reasoning, K-Nearest Neighbors (KNN), discriminant and regression functions, linear regression with least square error, logistic regression, Fisher's linear discriminant, minimum description length principle.

Unit-IV: Support Vector Machines & Neural Networks

Linear discriminant functions, perceptron algorithm, large margin classifiers, soft margin classifiers, kernel-induced feature spaces, nonlinear classification, regression using SVMs, introduction to neural networks, neuron models, perceptrons, Widrow-Hoff learning rule, error correction delta rule.

Unit-V: Advanced Neural Networks & Decision Trees

Multilayer perceptron networks, backpropagation algorithm, radial basis function networks, decision tree learning, classification using decision trees, impurity measures, ID3, C4.5, and CART

algorithms, pruning techniques, strengths and weaknesses of decision trees.

Textbooks:

1. M. Gopal, Applied Machine Learning, 2nd Edition, McGraw Hill Education, 2022.
2. Kevin P. Murphy, Probabilistic Machine Learning: An Introduction, MIT Press, 2022.

Reference Books:

1. Trevor Hastie, Robert Tibshirani, and Jerome Friedman, The Elements of Statistical Learning, 3rd Edition, Springer, 2023.
2. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2022.

Web Links:

1. https://www.coursera.org/learn/machine-learning
2. https://course.fast.ai/

MCA II Year I Semester

Cloud Computing

L	T	P	C
2	0	0	2

Subject Code: 24MCA3002

Course Objectives:

1. Implement virtualization techniques, apply virtualization concepts in cloud computing.
2. Develop and apply task scheduling algorithms, analyze scheduling strategies in cloud environments.
3. Utilize the Map-Reduce model, process large-scale data using parallel computing.
4. Build and deploy private cloud infrastructures, understand cloud service deployment models.
5. Examine the legal, societal, and ethical implications of cloud computing, assess security and privacy concerns.

Course Outcomes:

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

1. Interpret key challenges of cloud computing, understand cloud computing concepts.
2. Analyze economic, financial, and technological impact, compare cloud service models.
3. Assess organizational readiness for cloud computing, evaluate cloud adoption strategies.
4. Evaluate capacity building needs, identify skill gaps in cloud-related IT areas.
5. Illustrate virtualization concepts, demonstrate data center automation using virtualization.

UNIT – 1: Introduction to Cloud Computing

Basics and Characteristics of Cloud Computing, Cloud Service Models: IaaS, PaaS, SaaS, Types of Cloud Deployment: Public, Private, Hybrid, Distributed vs. Traditional Computing, Ethical and Security Issues in Cloud Computing.

UNIT - 2: Cloud Infrastructure & Platforms

Introduction to Major Cloud Providers (AWS, GCP, Azure), AWS Cloud Architecture (Basic Overview), Cloud Storage Basics (S3, Google Drive, Azure Blob), Cloud Application Use Cases, Open-Source Cloud Platforms (OpenStack).

UNIT - 3: Virtualization in Cloud Computing

Introduction to Virtualization and its Role in Cloud, Types of Virtualizations: Server, Storage, OS-level, Virtual Machines and Hypervisors (e.g., VMware, VirtualBox, Xen), Security and Performance Isolation in Virtualization, Basic Cloud Resource Management and Scheduling.

UNIT - 4: Cloud Storage & Security

Traditional vs Cloud-based Storage Models, Distributed File Systems (GFS, HDFS), Cloud Storage Services: Amazon S3, Google Cloud Storage, Major Security Risks in Cloud Environments, Trust and Privacy in Cloud Computing.

UNIT - 5: Cloud Application Development and Tools

Getting Started with AWS EC2 and S3, Introduction to Google App Engine / Google Cloud Services, Cloud Application Use Cases (Enterprise, Analytics, CRM), MapReduce Programming Model (Conceptual), Cloud-based Big Data Analytics (Overview), Introduction to Obsevability.

Text Books:

1. Dan C. Marinescu, Morgan Kaufmann (Elsevier), Third Edition, 2022, ISBN: 978-0-323-85277-7
2. Rajkumar Buyya, Satish N. Srirama, Christian Vecchiola, Shivananda Poojara, Thamarai Selvi. Cloud Computing: Principles and Paradigms, Second Edition, McGraw-Hill, 2024. ISBN: 978-93-5532-950-9

Reference Books:

1. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, McGraw-Hill, First Edition, 2009, ISBN: 978-0-07-162694-1

Web Links:

1. https://www.coursera.org/specializations/cloud-computing
2. https://aws.amazon.com/training/
3. https://learn.microsoft.com/en-us/training/azure/

MCA II Year I Semester

Web Technologies

L	T	P	C
3	0	0	3

Subject Code: 24MCA3003

Course Objectives:

1. To learn the core concepts of both the frontend and backend programming course.
2. To get familiar with the latest web development technologies.
3. To learn all about databases.
4. To learn complete web development process.
5. To provide an in-depth study of the various web development tools.

Course Outcomes:

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

1. Gain a fundamental understanding of internet technologies, including the World Wide Web (WWW), web browsers, web servers, and URL structures.
2. Design and structure responsive web pages using HTML, CSS, and Bootstrap, applying various styling techniques and layouts.
3. Utilize JavaScript and jQuery for client-side scripting, manipulate the Document Object Model (DOM), and manage user interactions dynamically.
4. Understand XML structure and schemas, and develop server-side applications using PHP to handle form data, sessions, and file operations.
5. Connect PHP with MySQL to perform CRUD operations and use AJAX for asynchronous data handling, improving web application performance.

Unit – 1

Introduction to the Internet: WWW, Web Browsers, Web Servers, URL, Domain Name System.
HTML: Html basic tags, Images, Hypertext Links, Lists, Tables, Forms.

Unit – 2

Cascading Style Sheets: CSS Syntax and Style - Class Selectors, ID Selectors, span and div Elements - style Attribute, style Container, External CSS Files - CSS Properties: Color Properties, Font Properties, Text Properties, shorthand style.
Bootstrap: Introduction to Bootstrap, Bootstrap Grid System, Bootstrap Components.

Unit – 3

JavaScript: Variables, if else, loops, Objects - Document Object Model, Functions, Forms: form Element, Controls, Text Control Accessing a Form's Control Values, Map, Reduce, Filter, Foreach, Introduction to Ajax.
jQuery: Selectors and DOM Manipulation, Traversing. JSON data format.

Unit – 4

Small XML: Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, well formed, using XML with application, Advanced JavaScript.
PHP: PHP basics, Handling Forms and User Input, Sessions, File Handling and Uploads.

Unit – 5

PHP with My MySQL: Database Connection, CRUD Operations, Form Handling, Data Validation.
PHP with ajax: Database Operations with AJAX & PHP.

Textbooks:

1. Web Design with HTML, CSS, JavaScript and JQuery Set Book by Jon Duckett Professional JavaScript for Web Developers Book by Nicholas C. Zakas.
2. Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating Dynamic Websites by Robin Nixon.
3. HTML, CSS, Bootstrap, Php, Javascript and MySql: All you need to know to create a dynamic site Kindle Edition by Olga Maria Stefania Cucaro (Author)

Reference Books:

1. Steven Holzner," HTML Black Book", Dreamtech press.
2. Web Technologies, Black Book, Dreamtech Press.
3. Web Applications: Concepts and Real-World Design, Knuckles, Wiley-India
4. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel Pearson.

Web Link:

1. https://www.tutorialspoint.com/web_developers_guide/web_basic_concepts.htm

MCA II Year I Semester

Cryptography and Network Security

L	T	P	C
3	0	0	3

Subject Code: 24MCA3004

Course Objectives:

1. To learn various cryptographic algorithms including secret key cryptography, hashes and message digests, public key algorithms,
2. To Familiar in design issues and working principles of various authentication protocols and various secure communication standards including Kerberos, IPsec, and S/MIME.\

Course Outcomes:

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

1. Explain Basic Principles, different security threats, countermeasures, foundation course of cryptography mathematics and Symmetric Encryption.
2. Classify the basic principles of Asymmetric key algorithms and operations of asymmetric key cryptography.
3. Design Cryptographic Hash Functions as SHA-3 and Digital Signatures as Elgamal.
4. Explain the concept of Revise Key Management and Distribution and User Authentication
5. Determine the knowledge of Network and Internet Security Protocols such as S/MIME.

UNIT - 1:

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 - 2:

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

UNIT - 3:

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

UNIT - 4:

Key Management and Distribution: Symmetric Key Distribution Using Symmetric Encryption, Symmetric Key Distribution Using Asymmetric Encryption, Distribution of Public Keys, X.509 Certificates. User Authentication: User Authentication, Remote User-Authentication Principle,

Remote User-Authentication Using Symmetric Encryption, Kerberos, Remote User-Authentication Using Asymmetric Encryption.

UNIT - 5:

Network and Internet Security Electronic Mail Security: Internet Mail Architecture, Email Formats, Email Threats and Comprehensive Email Security, Web Security, S/MIME. IP Security: IP Security Policy, Encapsulating Security Payload, Combining Security Associations Internet Key Exchange.

Text Books:

1. Cryptography and Network Security, 3rd Edition Behrouz A Forouzan, Deb deep Mukhopadhyay, McGraw Hill,2015
2. Cryptography and Network Security, William Stallings, Global Edition, 7e Pearson, 2017

Reference Books:

1. Network Security and Cryptography, First Edition, Bernard Meneges, Cengage Learning, 2018.

Web Link:

1. https://nptel.ac.in/crypography and network security.pdf

MCA II Year I Semester

Soft Computing
(Elective – II)

Subject Code: 24MCA3005

L	T	P	C
3	0	0	3

Course Objectives:

1. Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.
2. Introduce students to artificial neural networks and fuzzy theory from an engineering perspective.

Course Outcomes:

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

1. Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.
2. Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic.
3. To understand the fundamental theory and concepts of neural networks, Identify different neural network architectures, algorithms, applications and their limitations.
4. Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications.
5. Reveal different applications of these models to solve engineering and other problems.

UNIT - 1:

Fuzzy Set Theory: Introduction to Neuro, Fuzzy and Soft Computing, Fuzzy Sets, Basic function and Terminology, Set-theoretic Operations, Member Function Formulation and Parameterization, Fuzzy Rules and Fuzzy Reasoning, Extension Principle and Fuzzy Relations, Fuzzy If-Then Rules, Fuzzy Reasoning, Fuzzy Inference Systems, Mamdani Fuzzy Models, Sugeno Fuzzy Models, Tsukamoto Fuzzy Models, Input Space Partitioning and Fuzzy Modelling.

UNIT - 2:

Optimization: Derivative based Optimization, Descent Methods, and The Method of Steepest Descent, Classical Newton's Method, Step Size Determination, Derivative-free Optimization, Genetic Algorithms, Simulated Annealing, and Random Search, Downhill Simplex Search.

UNIT - 3:

Artificial Neural Networks: Introduction and ANN Structure, Biological neurons and artificial neurons. Model of an ANN, Activation functions used in ANNs, Typical classes of network architectures, Single layer perceptrons, Structure and learning of perceptrons. Feed forward ANN, Structures of Multi-layer feed forward networks, back propagation algorithm, Back propagation - training and convergence.

UNIT - 4:

Neuro Fuzzy Modelling: Adaptive Neuro-Fuzzy Inference Systems, Architecture Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN Coactive Neuro Fuzzy Modelling, Framework Neuron Functions for Adaptive Networks Neuro Fuzzy Spectrum.

UNIT - 5:

Introduction to Classical Sets and Fuzzy Sets: Crisp Sets and Fuzzy Sets – operations, Classical Relations and Fuzzy Relations - Cardinality, Properties and composition, Equivalence Relations.

Text Books:

1. "Neuro-Fuzzy and Soft Computing", J.S.R.Jang, C.T.Sun and E.Mizutani, PHI, 2004, Pearson Education 2004
2. Satish Kumar, "Neural Networks: A classroom approach", Tata McGraw Hill, 2004.
3. "Artificial Intelligence and Intelligent Systems", N.P.Padhy, Oxford University Press, 2006
4. Principles of Soft Computing- S N Sivanandam, SN Deepa, Wiley India, 2011.
5. V. Kecman, "Learning and Soft computing", Pearson Education, India.

Reference Books:

1. Artificial Intelligence, Second Edition, Elaine Rich & Kevin Knight, Tata McGraw Hill
2. Publishing Comp., New Delhi, , 2nd edition-2006
3. "Fuzzy Logic with Engineering Applications", Timothy J.Ross, McGraw-Hill, 3rd edition-1997
4. George J. Klir and Bo Yuan, "Fuzzy sets and Fuzzy Logic", Prentice Hall, USA 1995.
5. N. J. Nelsson, "Artificial Intelligence - A New Synthesis", Harcourt Asia Ltd.1998.
6. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y, 1989.
7. S. Haykins, "Neural networks: a comprehensive foundation". Pearson Education, India.

Web Links:

1. https://onlinecourses.nptel.ac.in/noc22_cs54/preview

MCA II Year I Semester

Software Project Management
(Elective – II)

L	T	P	C
3	0	0	3

Subject Code: 24MCA3006

Course Objectives:

1. This course is aimed at introducing the primary important concepts of project management related to managing software development projects.
2. They will also get familiar with the different activities involved in Software Project Management.
3. Further, they will also come to know how to successfully plan and implement a software project management activity, and to complete a specific project in time with the available budget.

Course Outcomes:

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

1. Identify the different project contexts .
2. Suggest an appropriate management strategy.
3. Practice the role of professional ethics in successful software development.
4. Identify and describe the key phases of project management.
5. Determine an appropriate project management approach through an evaluation of the business context and scope of the project.

UNIT - 1:

Conventional Software Management: The waterfall Model, Conventional Software Management Performance.

Evolution of Software Economics: software Economics. Pragmatic Software Cost Estimation. Improving Software Economics: Reducing Software Product Size, Improving Software Processes, Improving Team Effectiveness, Improving Automation, Achieving Required Quality, Peer Inspections.

UNIT - 2:

Conventional and Modern Software Management: Principles of Conventional Software Engineering, Principles of Modern Software Management, Transitioning to an interactive Process.

Life Cycle Phases: Engineering and Production Stages Inception, Elaboration, Construction, Transition phases.

UNIT - 3:

Artifacts of the Process: The Artifact Sets. Management Artifacts, Engineering Artifacts, Programmatic Artifacts.

Model Based Software Architectures: A Management Perspective and Technical Perspective.

UNIT - 4:

Flows of the Process: Software Process Workflows. Inter Trans Workflows.

Checkpoints of the Process: Major Mile Stones, Minor Milestones, Periodic Status Assessments.

Interactive Process Planning: Work Breakdown Structures, Planning Guidelines, Cost and Schedule Estimating. Interaction Planning Process, Pragmatic Planning.

UNIT - 5:

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, and Evolution of Organizations. Process Automation: Building Blocks, the Project Environment. Project Control and Process Instrumentation: Server Care Metrics, Management Indicators, Quality Indicators, Life Cycle Expectations Pragmatic Software

Text Books:

1. Walker Rayce, “Software Project Management”, 1998, PEA.
2. Henrey, “Software Project Management”, Pearson.

Reference Books:

1. Richard H.Thayer.” Software Engineering Project Management”, 1997, IEEE Computer Society.
2. Shere K.D.: “Software Engineering and Management”, 1998, PHI.
3. S.A. Kelkar, “Software Project Management: A Concise Study”, PHI.

Web Link:

1. https://onlinecourses.nptel.ac.in/noc19_cs70/preview

MCA II Year I Semester

UNIX Shell programming
(Elective – II)

L	T	P	C
3	0	0	3

Subject Code: 24MCA3007

Course Objectives:

1. Understand the fundamental concepts, history, and basic commands of UNIX.
2. Explore the UNIX file system, including file attributes, permissions, and directory structures.
3. Learn shell scripting concepts, including variables, control structures, and command execution.
4. Utilize UNIX filters and text-processing tools like grep, sed, and awk for efficient data manipulation.
5. Develop automation scripts using shell programming for system administration and process control.

Course Outcomes:

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

1. Gain hands-on experience in working with the UNIX environment and command-line interface.
2. Effectively manage file systems, user permissions, and process controls in UNIX.
3. Develop and debug shell scripts to automate repetitive tasks and system operations.
4. Analyze and manipulate text data efficiently using UNIX filters and scripting tools.
5. Apply UNIX concepts to real-world problem-solving in system administration and software development.

UNIT – 1:

Introduction to UNIX: Brief History, what is Unix, Unix Components, Using Unix, Commands in Unix, Some Basic Commands, Command Substitution, Giving Multiple Commands, Aliases.

UNIT - 2:

The File system –The Basics of Files-What's in a File-Directories and File Names-Permissions-INodes-The Directory Hierarchy, File Attributes and Permissions-The File Command knowing the File Type-The Chmod Command Changing File Permissions-The Chown Command Changing the Owner of a File-The Chgrp Command Changing the Group of a File.

UNIT - 3:

Using the Shell-Command Line Structure-Met Characters-Creating New Commands-Command Arguments and Parameters-Program Output as Arguments-Shell Variables- -More on I/O Redirection-Looping in Shell Programs.

UNIT - 4:

Filters-The Grep Family-Other Filters-The Stream Editor Sed-The AWK Pattern Scanning and processing Language-Good Files and Good Filters.

UNIT - 5:

Shell Programming-Shell Variables-The Export Command-The Profile File a Script Run During Starting-The First Shell Script-The read Command-Positional parameters-The $? Variable knowing the exit Status -The Exit Command-Branching Control Structures-Loop Control Structures-The Continue and Break Statement-The Expr Command: Performing Integer Arithmetic-Real Arithmetic in Shell Programs -The Sleep Command- The Script Command-The Eval Command-The Exec Command.

Text Books:

1. The Unix programming Environment by Brain W. Kernighan & Rob Pike, Pearson.
2. Introduction to Unix Shell Programming by M.G.Venkateshmurthy, Pearson.

Reference Books:

1. Unix and shell programming by B.M. Harwani, OXFORD university press.

Web Links:

1. https://www.tutorialspoint.com/unix/shell_scripting.htm
2. https://www.geeksforgeeks.org/introduction-linux-shell-shell-scripting/
3. https://www.shellscript.sh/first.html

MCA II Year I Semester

Data Warehousing and Data Mining
(Elective – II)

Subject Code: 24MCA3008

L	T	P	C
3	0	0	3

Course Objectives:

1. Explain the concept of databases, database management systems, database structures and how they work.
2. Make use of Entity-Relationship Modeling and Relational Modeling for creating simple databases from the real world scenarios.
3. Write relational algebra and structured query language (SQL) statements.
4. Normalize a database using Normalization Rules.
5. Discuss the issues associated with Transaction Management and Recovery, Tree Structured and Hash-Based Indexing.

Course Outcomes:

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

1. Illustrate the concept of databases, database management systems, database languages, database structures and their work.
2. Apply ER modeling and Relational modeling for designing simple databases.
3. Summarize the concepts related to relational model and SQL and Write database queries using relational algebra and structured query language.
4. Design and develop databases from the real world by applying the concepts of Normalization.
5. Outline the issues associated with Transaction Management and Recovery, Tree Structured and Hash-Based Indexing.

UNIT – 1:

Introduction: Data Mining, Kinds of Data Can Be Mined, Kinds of Patterns Can Be Mined, Technologies Used, Targeted Applications, Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity.

UNIT - 2:

Data Preprocessing: Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization

Data Warehousing and Online Analytical Processing: Basic Concepts, Data Warehouse Modeling: Data Cube and OLAP, Data Warehouse Implementation.

UNIT - 3:

Mining Frequent Patterns, Associations, and Correlations: Basic Concepts, Efficient and Scalable Frequent Item set Mining Methods, Are All the Pattern Interesting, Pattern Evaluation Methods, Applications of frequent pattern and associations.

Classification: Preliminaries, General Approach to Solving a Classification Problem, Decision Tree Induction, Model Overfitting, Rule-Based Classifier, Nearest-Neighbor classifier, Bayesian Classifier.

UNIT - 4:

Association Analysis: Problem Definition, Frequent Itemset Generation, Frequent Itemset Generation in the Apriori Algorithm, Rule Generation, Rule Generation in Apriori Algorithm, Compact Representation of Frequent item sets, FP-Growth Algorithm.

UNIT - 5:

Cluster Analysis: Overview, K-means, Agglomerative Hierarchical Clustering, DBSCAN.

Outlier Detection: Why outlier analysis, Types of Outliers, Challenges of Outlier Detection, Outlier Detection Methods, Statistical Approaches.

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, Mc Graw-Hill
3. Database Systems, 6/e Ramez Elmasri, Shamkant B. Navathe, Pearson

Reference Books:

1. DatabaseSystems,9/e, Carlos Coronel, Steven Morris, Peter Rob, Cengage
2. Introduction to Database Systems, 8/e, C J Date, Pearson

Web Links:

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

MCA II Year I Semester

Internet of things
(Elective – II)

Subject Code: 24MCA3009

L	T	P	C
3	0	0	3

Course Objectives:

1. To study the fundamentals about IoT To study about IoT Access technologies
2. To study the design methodology and different IoT hardware platforms.
3. To study the basics of IoT Data Analytics and supporting services.
4. To study the basics of IoT Data Analytics and supporting services.
5. To study about various IoT case studies and industrial applications.

Course Outcomes:

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

1. Understand the basics of IoT.
2. Implement the state of the Architecture of an IoT.
3. Understand design methodology and hardware platforms involved in IoT.
4. Understand how to analyze and organize the data.
5. Compare IOT Applications in Industrial & real world.

UNIT – 1: FUNDAMENTALS OF IOT
Introduction - Definition and Characteristics of IoT - Physical design - IoT Protocols - Logical design - IoT communication models, IoT Communication APIs - Enabling technologies - Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates - Domain specific IoTs - IoT Architectural view.

UNIT - 2: ELEMENTS OF IOT
IoT and M2M- difference between IoT and M2M - Software Defined Networks - Network Function Virtualization - IoT systems management – Needs - NETCONF, YANG - IoT design methodology.

UNIT - 3: IOT PROTOCOLS
Sensors and actuators - Communication modules – Zigbee - LoRa - RFID - Wi-Fi - Power sources.

UNIT - 4: BUILDING IoT WITH CLOUD AND DATA ANALYTICS
IoT platforms – Arduino – Raspberry Pi - Cloud Computing in IoT - Cloud Connectivity - Big Data Analytics - Data Visualization.

UNIT - 5: CHALLENGES IN IOT AND CASE STUDIES
Security Concerns and Challenges - Real time applications of IoT – Home automation – Automatic lighting – Home intrusion detection – Cities – Smart parking – Environment – Weather monitoring system – Agriculture – Smart irrigation.

Text Books:

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things-A hands-on approach", Universities Press, 2015
2. Olivier Hersent, David Boswarthick, Omar Elloumi, “The Internet of Things: Key applications and Protocols”, Wiley Publications 2nd edition , 2013

Reference Books:

1. Raj Kamal, “Internet of Things – Architecture and Design Principles”, Mc Graw Hill Education Pvt. Ltd., 2017
2. Internet of Things and Data Analytics, Hwaiyu Geng, P.E, Wiley Publications, 2017
3. Manoel Carlos Ramon, ―Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers‖, Apress, 2014
4. Marco Schwartz, ―Internet of Things with the Arduino Yun‖, Packt Publishing, 2014
5. Adrian McEwen, Hakim Cassimally, “Designing the Internet of Things”, Wiley Publications.

Web Links:

1. https://onlinecourses.nptel.ac.in/noc25_cs44/preview

MCA II Year I Semester

Machine Learning with Python Lab

Subject Code: 24MCA3011

L	T	P	C
0	0	3	1.5

Course Objectives:

1. Develop an understanding of various machine learning algorithms and their applications.
2. Implement and analyze fundamental ML techniques such as classification, regression, and clustering.
3. Gain hands-on experience with key ML libraries like NumPy, Pandas, Scikit-Learn, and TensorFlow.
4. Evaluate and compare different ML models based on accuracy, precision, and recall.
5. Learn data visualization techniques for effective interpretation of ML results.

Course Outcomes (COs):

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

1. Implement machine learning algorithms to solve real-world problems.
2. Choose an appropriate machine learning algorithm for a given problem.
3. Interpret and compare results from different machine learning models.
4. Acquire proficiency in utilizing Python libraries (Matplotlib, Pandas, Seaborn).
5. Able to construct and test intelligent systems for specific applications, such as document classification and medical diagnosis using Bayesian Networks.

List of Experiments:

1. **Principal Component Analysis (PCA) & Singular Value Decomposition (SVD)**
   - Implement PCA and SVD using NumPy.
2. **FIND-S Algorithm**
   - Implement the FIND-S algorithm for finding the most specific hypothesis from a given training dataset (CSV file).
3. **Candidate Elimination Algorithm**
   - Implement the Candidate Elimination algorithm to output all hypotheses consistent with the training examples.
4. **Decision Tree (ID3 Algorithm)**
   - Implement the ID3 algorithm using an appropriate dataset to build and classify a decision tree.
5. **Artificial Neural Network (ANN) - Backpropagation Algorithm**
   - Build and test an ANN using the backpropagation algorithm.
6. **Naïve Bayes Classifier**
   - Implement the Naïve Bayesian classifier and compute its accuracy using test datasets.
7. **Naïve Bayes Classifier for Document Classification**
   - Apply the Naïve Bayes Classifier to classify text documents and compute accuracy, precision, and recall.
8. **Bayesian Network for Medical Diagnosis**
   - Construct a Bayesian network for diagnosing heart disease using standard medical datasets.
9. **Expectation-Maximization (EM) & K-Means Clustering**

- Apply EM and K-Means clustering to a dataset, compare results, and evaluate clustering quality.

10. **K-Nearest Neighbors (KNN) Classification**
    - Implement KNN on the Iris dataset and print correct and incorrect predictions.
11. **Locally Weighted Regression**
    - Implement non-parametric locally weighted regression and visualize results using graphs.
12. **Data Visualization using Matplotlib, Pandas, and Seaborn**
    - Generate the following plots on the Iris and Wine Reviews datasets:
      a) Scatter Plot
      b) Line Chart
      c) Histogram
      d) Heatmap

Textbooks:

1. Hands-On Machine Learning with Scikit-Learn and TensorFlow 2e: Concepts, Tools, and Techniques to Build Intelligent Systems, Aurelien Geron, 2019.

Reference Books:

1. Scikit-Learn Documentation: https://scikit-learn.org/stable/tutorial/index.html
2. UCI Machine Learning Repository: https://archive.ics.uci.edu/ml/index.php
3. PCA & SVD Explanation: https://towardsdatascience.com/pca-and-svd-explained-with-numpy-5d13b0d2a4d8
4. Data Visualization in Python: https://towardsdatascience.com/introduction-to-data-visualization-in python-89a54c97fbed

MCA II Year I Semester

Web Technologies Lab

L	T	P	C
0	0	3	1.5

Subject Code: 24MCA3012

Course Objectives:

1. To implement the web pages using HTML and apply styles.
2. Able to develop a dynamic webpage using java script.
3. Design to create structure of web page, to store the data in web document, and transport information through web.
4. Able to write a well-formed / valid XML document.
5. Able to work web application with database.

Course Outcomes (COs):

On completion of this course, students will be able to

1. Create dynamic and interactive web pages using HTML, CSS, Java Script and jQuery
2. Experiment with Learn and implement XML concepts
3. Able to write queries in SQL by using database packages like MySQL
4. Develop web applications using PHP
5. Implement web application with database connectivity

List of Experiments:

Experiment 1

Develop static pages (using HTML and CSS) of an online book store. The pages should resemble: www.flipkart.com The website should consist the following pages.

a) Home page
b) Registration and user Login
c) User Profile Page
d) Books catalogue
e) Shopping Cart
f) Payment By credit card
g) Order Conformation

Experiment 2

Create and save an XML document on the server, which contains 10 users' information. Write a program, which takes User Id as an input and returns the user details by taking the user information from the XML document.

Experiment 3

Validate the Registration, user login, user profile and payment by credit card pages using JavaScript**.**

Experiment 4

Design a job application with Bootstrap.

Experiment 5

Write a jQuery program to demonstrate DOM manipulation.

Experiment 6

Write a PHP script to merge two arrays and sort them as numbers, in descending order.

Experiment 7

Write a PHP script to: a. Find the length of a string, b. Count no of words in a string, c. Reverse a string. d. Search for a specific string.

Experiment 8

Write a PHP Script for login authentication. Design an html form which takes username and password from user and validate against stored username and password in file.

Experiment 9

Write PHP Script for storing and retrieving user information from MySQL table.

A. 1.Design A HTML page which takes Name, Address, Email and Mobile no from user (register.php)
B. Store this data in MySQL database.
C. Next page display all user in html table using PHP (display.php)

Experiment 10:

Write a PHP script for user authentication using PHP-MYSQL. Use session for storing username.

Experiment 11:

Using ajax fetch information from a database.

Experiment 12:

Build a Basic Web Page Using Flask Objective: Create a simple web server that displays a "Hello, World!" message in the browser.

Experiment 13:

Create a Web Form and Handle POST Request Objective: Build a simple web form that accepts a user's name and displays a greeting message.

Experiment 14:

Database operations using python.

Text Books:

1. Web Design with HTML, CSS, JavaScript and JQuery Set Book by Jon Duckett Professional JavaScript for Web Developers Book by Nicholas C. Zakas.
2. Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating Dynamic Websites by Robin Nixon.
3. HTML, CSS, Bootstrap, Php, Javascript and MySql: All you need to know to create a dynamic site Kindle Edition by Olga Maria Stefania Cucaro (Author).

Reference Books:

1. Steven Holzner," HTML Black Book", Dreamtech press.
2. Web Technologies, Black Book, Dreamtech Press
3. Web Applications: Concepts and Real-World Design, Knuckles, Wiley-India
4. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel Pearson.

MCA II Year I Semester

Cloud Computing lab

L	T	P	C
0	0	2	1

Subject Code: 24MCA3013

Course Objectives:

1. Understand and implement core AWS storage services using S3 and its features like versioning and static website hosting.
2. Gain hands-on experience with AWS data analytics tools such as Athena and Glue for querying and cataloguing data.
3. Develop and deploy serverless computing solutions using AWS Lambda and integrate them with S3 triggers
4. Monitor and troubleshoot cloud-based applications using AWS CloudWatch logs and metrics.
5. Launch, configure, and manage AWS compute and database services including EC2 and RDS.

Course Outcomes (COs):

On completion of this course, students will be able to

1. Create and manage S3 buckets, enable versioning, and host static websites using AWS.
2. Upload, query, and catalog S3 data using Athena and AWS Glue services.
3. Design and deploy AWS Lambda functions with S3 event triggers for automation.
4. Monitor serverless applications using CloudWatch for efficient debugging and performance tracking.
5. Provision and manage EC2 instances and RDS databases for scalable cloud computing solutions.

List of Experiments:

1. Experiment 1: Create an S3 Bucket
2. Experiment 2: Upload Files to S3 Bucket
3. Experiment 3: Enable Versioning on S3 Bucket
4. Experiment 4: Query S3 Data with Athena
5. Experiment 5: Use Glue to Crawl S3 Data
6. Experiment 6: Schedule Glue Crawler
7. Experiment 7: Create a Lambda Function
8. Experiment 8: Trigger Lambda with S3

ADDITIONAL EXPERIMENTS

9. Experiment 9: Monitor Lambda Logs in CloudWatch
10. Experiment 10: Create an RDS Database (MySQL)
11. Experiment 11: Launch an EC2 Instance
12. Experiment 12: Host Static Website on S3
13. Experiment 13: Lambda to Process and Copy S3 Files

Text Books:

1. Amazon Web Services in Action by Andreas Wittig & Michael Wittig, Manning Publications, 2nd Edition, 2018.
2. Learning Amazon Web Services (AWS): A Hands-On Guide to the Fundamentals of AWS Cloud, Mark Wilkins, Addison-Wesley Professional (Pearson) Publications, 2nd Edition, 2019.

MCA II Year II Semester

Cyber Crime and Law Protection
(Elective – III)

L	T	P	C
3	0	0	3

Subject Code: 24MCA4001

Course Objectives:

1. Understand the fundamental concepts of cybercrime, including its types and impacts.
2. Explore the national and state-level legal frameworks for cybersecurity in India.
3. Learn about cybercrime investigation techniques and digital forensics.
4. Develop an understanding of ethical hacking and preventive cybersecurity measures.
5. Analyze real-world case studies to apply theoretical knowledge practically.

Course Outcomes:

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

1. Differentiate between types of cybercrime and identify their root causes.
2. Analyze and apply national and state-level provisions under Indian cyber laws.
3. Utilize digital forensic tools and techniques for cybercrime investigation.
4. Implement ethical hacking and cybersecurity measures in practice.
5. Critically evaluate real-world cybercrime cases and emerging cybersecurity trends.

UNIT – 1: Introduction to Cyber Crime

Overview of Cyber Crime and Cyber Law, Evolution of Cyber Crimes, Types of Cyber Crimes, Cyber Crime vs. Traditional Crime, Classification of Cyber Crimes: Individuals, Property, Government, Society, Causes and Motivations Behind Cyber Crimes.

UNIT - 2: National and State Legal Frameworks for Cyber Security

National Laws: Information Technology Act, 2000, Amendments to IT Act, Cyber Crimes under Indian Penal Code (IPC), National Cyber Security Policy, 2013, Data Protection Bill in India, Intellectual Property Rights in Cyberspace, Jurisdiction and Legal Challenges in Indian Cyber Law.

State Laws: Andhra Pradesh Cyber Security Policy, Andhra Pradesh Data Protection and Governance Policies, Initiatives for Reducing Cyber Crimes in Andhra Pradesh, State-specific Data Protection Rules and Regulations.

UNIT - 3: Cyber Crime Investigation and Digital Forensics

Fundamentals of Cyber Crime Investigation, Digital Forensics Process, Digital Evidence Collection, Chain of Custody and Evidence Preservation, Disk Imaging and Memory Analysis, Forensic Tools: Network Analysis and Disk Imaging, Challenges in Cyber Crime Investigation.

UNIT - 4: Cyber Security Measures and Ethical Hacking

Basics of Cyber Security: Threats, Vulnerabilities, and Attacks, Cyber Security Strategies: Prevention, Detection, Response, Role of Encryption and Authentication, Ethical Hacking: Concepts, Phases, Tools and Techniques, Legal and Ethical Boundaries in Cyber Space.

UNIT - 5: Emerging Trends and Case Studies in Cyber Law

Landmark Cases in Cyber Crime and Cyber Law (Indian and International), Cyber Warfare and Cyber Terrorism, Data Privacy Laws: GDPR and Data Protection Bill in India, State-Level Privacy Initiatives in Andhra Pradesh, Emerging Threats: IoT Security, AI in Cyber Security,

Future of Cyber Crime and Cyber Law.

Textbooks:

1. Singer, P. W., & Friedman, A. (2014). Cybersecurity and Cyberwar: What Everyone Needs to Know. Oxford University Press. ISBN: 978-0199918119
2. Duggal, P. (2023). Cyber Law. LexisNexis. ISBN: 978-8196241070
3. Casey, E. (2011). Digital Evidence and Computer Crime. Academic Press. ISBN: 978-0123742681
4. Chawki, M., Wahab, M. S., & Abbasi, A. (2011). The Law of Cybercrimes and Their Investigations. CRC Press. ISBN: 978-1439851577

Reference Books:

1. Britz, M. T. (2013). Computer Forensics and Cyber Crime: An Introduction. Pearson. ISBN: 978-0132677714
2. Tikk, E., Kaska, K., & Vihul, L. (2013). Introduction to Cyber-Warfare: A Multidisciplinary Approach. Syngress. ISBN: 978-0124078147
3. Akhgar, B., & Brewster, B. (2012). Cyberlaw: The Law of the Internet and Information Technology. Pearson. ISBN: 978-0132560870
4. Matwyshyn, A. M. (2009). Privacy, Security, and Information Management: An Overview. Van Haren Publishing. ISBN: 978-9087535403

Web Links:

1. https://onlinecourses.nptel.ac.in/noc23_cs127/preview
2. https://www.coursera.org/learn/privacy-law-data-protection

MCA II Year II Semester

Data Wrangling and Data Visualization
(Elective – III)

Subject Code: 24MCA4002

L	T	P	C
3	0	0	3

Course Objectives:

1. To learn data wrangling techniques
2. To introduce visual perception and core skills for visual analysis

Course Outcomes:

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

1. Perform data wrangling
2. Explain principles of visual perception
3. Apply core skills for visual analysis
4. Apply visualization techniques for various data analysis tasks
5. Evaluate visualization techniques

UNIT – 1:
Data Wrangling: Need of data cleanup, data clean up basics – formatting, outliers, duplicates, Normalizing and standardizing data.

UNIT - 2:
Introduction of visual perception, visual representation of data, Gestalt principles, information overloads. Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications.

UNIT - 3:
Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents.

UNIT - 4:
Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization.

UNIT - 5:
Visualization of volumetric data, vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, evaluating visualizations.

Text Books:

1. Jacqueline Kazil and Katharine Jarmul, Data Wrangling with Python: Tips and Tools to Make Your Life Easier, O'Reilly.
2. Ward, Grinstein Keim, Interactive Data Visualization: Foundations, Techniques, and Applications. Natick A K Peters, Ltd

Reference Books:

1. Tufte, The Visual Display of Quantitative Information, Graphics Press

Web Links:

1. https://www.coursera.org/learn/data-visualization
2. https://www.coursera.org/learn/python-for-data-visualization#syllabus

MCA II Year II Semester

Deep Learning
(Elective – III)

L	T	P	C
3	0	0	3

Subject Code: 24MCA4003

Course Objectives:

1. Understand the fundamentals of neural networks and deep learning.
2. Explore different architectures such as feedforward networks, convolutional neural networks (CNNs), and recurrent neural networks (RNNs).
3. Study optimization techniques for deep learning models.
4. Learn about generative models, including Variational Autoencoders (VAEs) and Generative Adversarial Networks (GANs).
5. Apply deep learning techniques in various areas such as computer vision, natural language processing (NLP), and speech recognition.

Course Outcomes:

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

1. Understand the structure and working of feedforward and deep neural networks.
2. Mathematically analyze deep learning algorithms and optimization methods.
3. Implement deep learning techniques for real-world applications.
4. Train deep networks efficiently using different regularization and optimization strategies.
5. Apply deep learning models to vision, NLP, and speech applications.

UNIT – 1: Fundamentals of Neural Networks
Biological Neuron, Computational Neuron, McCulloch–Pitts Unit, Thresholding Logic, Linear Perceptron, Perceptron Learning Algorithm, Linear Separability, Convergence Theorem for Perceptron Learning Algorithm.

UNIT - 2: Feedforward and Deep Neural Networks
IoT and M2M- difference between IoT and M2M - Software Defined Networks - Network Function Virtualization - IoT systems management – Needs - NETCONF, YANG - IoT design methodology.

UNIT - 3: Optimization & Regularization Techniques
Optimization Methods: Adagrad, Adadelta, RMSprop, Adam, Nesterov Accelerated Gradient (NAG), Second-order Methods, Saddle Point Problem, Regularization Techniques: Dropout, Drop Connect, Batch Normalization.

UNIT - 4: Recurrent and Convolutional Neural Networks
Recurrent Neural Networks (RNNs): Backpropagation Through Time (BPTT), Long Short-Term Memory (LSTM), Gated Recurrent Units (GRUs), Bidirectional LSTMs, Bidirectional RNNs.
Convolutional Neural Networks (CNNs): LeNet, AlexNet, Generative Models: Restricted Boltzmann Machines (RBMs), Markov Chain Monte Carlo (MCMC), Gibbs Sampling, Gradient Computation in RBMs, Deep Boltzmann Machines.

UNIT - 5: Advanced Topics & Applications
Recent Trends in Deep Learning: Variational Autoencoders (VAEs), Generative Adversarial Networks (GANs), Multi-task Deep Learning, Multi-view Deep Learning.

Applications of Deep Learning: Computer Vision, Natural Language Processing (NLP), Speech Processing.

Textbooks:

1. François Chollet & Matthew Watson, Deep Learning with Python, Third Edition, Manning Publications, April 2025.
2. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.

Reference Books:

1. Raúl Rojas, Neural Networks: A Systematic Introduction, 1996.
2. Christopher Bishop, Pattern Recognition and Machine Learning, 2007.
3. François Chollet, Deep Learning with Python, Manning Publications, 2017.

Web Links:

1. https://www.coursera.org/specializations/deep-learning
2. https://course.fast.ai/

MCA II Year II Semester

Ad-hoc and Sensor Networks
(Elective – III)

Subject Code: 24MCA4004

L	T	P	C
3	0	0	3

Course Objectives:

1. Explain the basics of Ad hoc networks and routing protocols.
2. Apply the knowledge to identify appropriate physical and MAC layer protocols.
3. Interpret the basics of Sensor networks and routing protocols.
4. Apply the knowledge to identify the suitable routing algorithm based on the network and user requirement.
5. Analyze the security issues possible in Ad hoc and sensor network.

Course Outcomes:

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

1. Describe the design principles for Ad hoc Networks
2. Classify the MAC Protocols for Adhoc networks
3. Discuss the design principles for Wireless Sensor Networks
4. Elaborate on the concepts of Energy Efficient Unicast Routing Protocol
5. Analyze the various attacks in Wireless sensor networks

UNIT – 1:
INTRODUCTION TO AD-HOC NETWORKS: Fundamentals of Wireless Communication Technology- Characteristics of the Wireless Channel - mobile ad hoc networks (MANETs) - concepts and architectures.
AD-HOC NETWORKS ROUTING PROTOCOLS: Issues in designing a routing protocol for Ad hoc networks- proactive routing, reactive routing (on-demand), hybrid routing- Classification of routing protocols. Transport Layer solutions-TCP over Ad hoc wireless Networks.

UNIT - 2:
MAC PROTOCOLS FOR AD-HOC WIRELESS NETWORKS: Issues in designing a MAC Protocol- Design goal of MAC Protocol-Classification of MAC Protocols- Contention based protocols Contention based protocols with Reservation Mechanisms- Contention based protocols with Scheduling Mechanisms.MAC Protocols that use directional Antennas and Multichannel MAC Protocols.

UNIT - 3:
INTRODUCTION TO SENSOR NETWORKS: Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks, WSN application examples, Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes. SENSOR **NETWORKS ARCHITECTURE:** Sensor Network Architecture - Sensor Network Scenarios, Transceiver Design Considerations, Optimization Goals and Figures of Merit.

UNIT - 4:
WSN NETWORKING CONCEPTS: MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols and Wakeup Concepts - S-MAC, The Mediation Device Protocol, Contention based protocols - PAMAS, Schedule based protocols – LEACH, IEEE 802.15.4 MAC protocol.

WSN ROUTING PROTOCOLS: Routing Protocols- Energy Efficient Routing, Geographic routing Challenges and Issues in Transport layer protocol.

UNIT - 5:

ENSOR NETWORK SECURITY: Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Layer wise attacks in wireless sensor networks, possible solutions for jamming, tampering, black hole attack, flooding attack. Key Distribution and Management, Secure Routing – SPINS, reliability requirements in sensor networks.

Textbooks:

1. Siva Ram Murthy and B. S. Manoj, ”Ad Hoc Wireless Networks Architectures and Protocols”, Second Edition, Pearson Publication, Reprinted in 2015.
2. Holger Karl and Andreas Willig,”Protocol and Architecture for Wireless Sensor Networks”, First Edition, John wiley publication, Reprinted in 2011.

Reference Books:

1. Fei Hu, Xiaojun Cao and Auerbach, “Wireless Sensor Networks — Principles and Practice,” CRC Press, Taylor & Francis Group, 2010.
2. Raheem Beyah, Janise McNair and Cherita Corbett. “Security in Ad hoc and Sensor Networks” World Scientific Publications / Cambridge University Press, 2010
3. Jagannathan Sarangapani,” Wireless Ad hoc and Sensor Networks — Protocols”, Performance and Control, CRC Press, Taylor & Francis Group, 2010.

Web Links:

1. https://nptel.ac.in/wireless Ad Hoc and Sensor Networks.pdf

MCA II Year II Semester

Network Programming
(Elective – IV)

Subject Code: 24MCA4006

L	T	P	C
3	0	0	3

Course Objectives:

1. Provide an understanding of socket programming and the fundamental concepts of TCP/IP networking.
2. Explore various I/O models, multiplexing, and signal handling to enhance network communication efficiency.
3. Explain socket options, UDP socket programming, and domain name system (DNS) resolution.
4. Discuss advanced socket concepts, multithreading, and raw sockets for building robust and scalable network applications.
5. Introduce Simple Network Management Protocol (SNMP) for network monitoring and management.

Course Outcomes:

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

1. Demonstrate a clear understanding of socket programming and the TCP/IP protocol suite.
2. Apply I/O multiplexing techniques (e.g., select(), poll()) to handle multiple connections efficiently.
3. Utilize socket options and implement UDP-based applications for connectionless communication.
4. Implement multithreading techniques and use synchronization primitives (mutexes, condition variables) for concurrent processing. .
5. Understand and apply network management techniques using SNMP for monitoring and troubleshooting.

UNIT – 1:

ELEMENTARY TCP SOCKETS: Introduction to socket programming – Overview of TCP / IP protocols – Introduction to sockets – Socket address structures – Byte ordering functions – Address conversion functions – Elementary TCP sockets – Socket – Connect – Bind – Listen – Accept – Read – Write – Close functions – Iterative server – Concurrent server.

UNIT - 2:

APPLICATION DEVELOPMENT: TCP echo server – TCP echo client – POSIX signal handling – Server with multiple clients – Boundary conditions– Server process crashes– Server host crashes – Server crashes and reboots – Server shutdown – I/O multiplexing – I/O models – Select function – Shutdown function – TCP echo server (with multiplexing) – Poll function – TCP echo client (with multiplexing)

UNIT - 3:

SOCKET OPTIONS, ELEMENTARY UDP SOC SOCKETS: Socket options – Getsocket and setsocket functions – Generic socket options – IP socket options – ICMP socket options – TCP socket options – Elementary UDP sockets – UDP echo server – UDP echo client – Multiplexing TCP and UDP sockets – Domain Name System – Gethostbyname function – IPV6 support in DNS – Gethostbyadr function – Getservbyname and getservbyport functions.

UNIT - 4:

ADVANCED SOCKETS: IPV4 and IPV6 interoperability – Threaded servers – Thread creation and termination– TCP echo server using threads – Mutexes – Condition variables – Raw sockets – Raw socket creation – Raw socket output – Raw socket input – Ping program – Trace route program.

UNIT - 5:

SIMPLE NETWORK MANAGEMENT SNMP: network management concepts – SNMP management information – Standard MIB's – SNMP V1 protocol and practical issues – Introduction to RMON, SNMP V2 and SNMP V3.

Textbooks:

1. W. Richard Stevens, ―Unix Network Programming Vol – I‖, 2nd Edition, Prentice Hall of India / Pearson Education, 1998.
2. William Stallings, ―SNMP, SNMPV2, SNMPV3 and RMON 1 and 2‖, 3rd Edition, Addison Wesley, 1999.
3. E. Comer, ―Internetworking with TCP/IP Vol – III‖, (BSD Sockets Version), 2nd Edition, Prentice Hall of India, 2003.
4. UNIX Network Programming, W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, Third Edition, Pearson Education,2015
5. UNIX Network Programming, W. Richard Stevens. Second Edition Pearson,2015

Reference Books:

1. UNIX Systems Programming using C++, T Chan, First Edition,Pearson,2015
2. UNIX for Programmers and Users, Graham Glass, King abls, Third Edition Pearson Education, 2003
3. Advanced UNIX Programming, M. J. ROCHKIND, Second Edition Pearson Education,2004.

Web Links:

1. http://wps.aw.com/aw_kurose_network_2
2. http://www.kohala.com/start/unpv12e.html
3. http://www.netbook.cs.purdue.edu

MCA II Year II Semester

Block Chain technologies
(Elective – IV)

Subject Code: 24MCA4007

L	T	P	C
3	0	0	3

Course Objectives:

The block chain technology course allows the students to explore the driving force behind the cryptocurrency Bitcoin. Along with Decentralization, Cryptography, Bitcoins with its alternative coins, Smart contracts and outside of currencies.

Course Outcomes:

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

1. Understand the types, benefits and limitations of block chain.
2. Explore the block chain decentralization and cryptography concepts.
3. Enumerate the Bitcoin features and its alternative options.
4. Describe and deploy smart contracts
5. Summarize the block chain features outside of currencies

UNIT – 1:
What is Block chain, Block chain Technology Mechanisms & Networks, Block chain Origins, Objective of Block chain, Block chain Challenges, Transactions and Blocks.

UNIT - 2:
P2P Systems, Keys as Identity, Digital Signatures, Hashing, and public key cryptosystems, private vs. public Blockchain. CAP theorem and block chain, Block chain Network, Mining Mechanism.

UNIT - 3:
Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Block chain application, Soft & Hard Fork, Private and Public block chain. Benefits and limitations of block chain.

UNIT - 4:
Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate.

UNIT - 5:
Decentralization, Decentralization using block chain, Methods of decentralization, Routes to decentralization, Decentralized organizations.

Textbooks:

1. Mastering Block chain - Distributed ledgers, decentralization and smart contracts explained, Author- Imran Bashir, Packt Publishing Ltd, Second Edition, ISBN 978-1-78712-544-5, 2017.

Reference Books:

1. Blockchain Basics: A Non-Technical Introduction in 25 Steps, Author- Daniel Drescher, Apress, First Edition, 2017.

Web Links:

1. https://jntuh.ac.in/uploads/syllabus/BC-%20Syllabus%20-Subj-1-BLACKCHAIN%20TECHNOLOGY.pdf

MCA II Year II Semester

Software Testing Methodologies
(Elective – IV)

L	T	P	C
3	0	0	3

Subject Code: 24MCA4008

Course Objectives:

1. To study fundamental concepts in software testing and discussing various software testing issues and solutions in software unit, integration, regression and system testing
2. To learn how to plan a test project, design test cases and data, conduct testing, manage software problems and defects, generate a test report
3. To expose the advanced software testing concepts such as object-oriented software testing methods, web-based and component-based software testing
4. To understand software test automation problems and solutions
5. To learn how to write software test documents and communicate with engineers in various forms.

Course Outcomes:

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

1. Identify and understand various software testing problems, apply software testing knowledge and engineering methods and solve these problems by designing and selecting software test models, criteria, strategies, and methods
2. Design and conduct a software test process for a software project
3. Analyze the needs of software test automation. Use various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects
4. Basic understanding and knowledge of contemporary issues in software testing, such as component-based, web-based and object-oriented software testing problems
5. Write test cases for given software to test it before delivery to the customer and write test scripts for both desktop and web-based applications.

UNIT – 1:

Software Testing: Introduction, Evolution, Myths & Facts, Goals, Psychology, definition, Model for testing, Effective Vs Exhaustive Software Testing. Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle, Software Testing Methodology.

Verification and Validation: Verification & Validation Activities, Verification, Verification of Requirements, High level and low-level designs, verifying code, Validation.

UNIT - 2:

Dynamic Testing-Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table-based testing, Cause-Effect Graphing based testing, Error guessing.

White-Box Testing: need, Logic Coverage criteria, Basis Path testing, Graph matrices, Loop testing, data flow testing, mutation testing.

UNIT - 3:

Static Testing: Inspections, Structured Walkthroughs, Technical Reviews. Validation activities: Unit testing, Integration Testing, Function testing, system testing, acceptance testing.

Regression testing: Progressives Vs regressive testing, Regression test ability, Objectives of regression testing, Regression testing types, Regression testing techniques.

UNIT - 4:

Efficient Test Suite Management: growing nature of test suite, Minimizing the test suite and its benefits, test suite prioritization, Types of test case prioritization, prioritization techniques, measuring the effectiveness of a prioritized test suite.

Software Quality Management: Software Quality metrics, SQA models. Debugging: process, techniques, correcting bugs.

UNIT - 5:

Automation and Testing Tools: need for automation, categorization of testing tools, selection of testing tools, Cost incurred, Guidelines for automated testing, overview of some commercial testing tools such as Win Runner, Load Runner, Jmeter and JUnit.

Textbooks:

1. Software Testing, Principles and Practices, Naresh Chauhan, Oxford
2. Software Testing, Yogesh Singh, CAMBRIDGE

Reference Books:

1. Foundations of Software testing, Aditya P Mathur, 2ed, Pearson
2. Software testing techniques – Baris Beizer, Dreamtech, second edition.
3. Software Testing, Principles, techniques and Tools, M G Limaye, TMH
4. Effective Methods for Software testing, Willian E Perry, 3ed, Wiley

Web Links:

1. https://www.tutorialspoint.com/software testing dictionary/test tools.htm

MCA II Year II Semester

Big Data Analytics
(Elective – IV)

Subject Code: 24MCA4009

L	T	P	C
3	0	0	3

Course Objectives:

1. To know the fundamental concepts of big data and analytics.
2. To explore tools and practices for working with big data
3. To learn about stream computing.
4. To know about the research that requires the integration of large amounts of data.
5. NO SQL Data Management for Big Data and Visualization.

Course Outcomes:

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

1. Identify the need-based tools, viz., Pig and Hive and handle and formulate an effective strategy to implement a successful Data analytics project
2. Organize the existing technologies and the need for distributed files systems to analyze the big data
3. To Discuss the cluster and classification techniques
4. Analyze the concepts of stream memory and spark models.
5. Explain the use of NoSQL database in data analytics.

UNIT – 1:

Introduction to Big Data- Evolution of Big data, Best Practices for Big data Analytics, Big data characteristics, Validating, The Promotion of the Value of Big Data, Big Data Use Cases, Characteristics of Big Data Applications, Perception and Quantification of Value, Understanding Big Data Storage, A General Overview of High, Performance Architecture, HDFS, MapReduce and YARN, Map Reduce Programming Model.

UNIT - 2:

Frameworks-Applications on Big Data Using Pig and Hive,Data processing operators in Pig, Hive services, HiveQL, Querying Data in Hive, fundamentals of HBase and Zoo Keeper, IBM InfoSphere Big Insights and Streams.

UNIT - 3:

Clustering and Classification-Advanced Analytical Theory and Methods: Overview of Clustering, K-means, Use Cases- Overview of the Method, Determining the Number of Clusters, Diagnostics, Reasons to Choose and Cautions. Classification: Decision Trees, Overview of a Decision Tree, The General Algorithm, Decision Tree Algorithms, Evaluating a Decision Tree, Decision Trees in R, Naive Bayes, Baye'sTheorem, Naive Bayes Classifier.

UNIT - 4:

Stream Memory and Spark- Introduction to Streams Concepts, Stream Data Model and Architecture, Stream Computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Introduction to Spark Concept, Spark Architecture and components, spark installation, spark RDD(Resilient Distributed Dataset), spark RDD operations.

UNIT - 5:

NOSQL Data Management for Big Data and Visualization- NoSQL Databases: Schema-less Models: Increasing Flexibility for Data Manipulation, Key Value Stores, Document Store, Tabular Stores, Object Data Stores, Graph Databases Hive, Sharding, Hbase, Analyzing big data with twitter, big data for E Commerce Big data for blogs, Review of Basic Data Analytic Methods using R.

Textbooks:

1. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
2. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools,Techniques, NoSQL, and Graph", Morgan Kaufmann/El sevier Publishers, 2013.

Reference Books:

1. Michael Berthold, David J.Hand, “Intelligent Data Analysis”, Springer,2007.
2. Tom White “Hadoop: The Definitive Guide” Third Edition, O’reillyMedia,2012.
3. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data”, McGrawHill Publishing,2012.
4. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Advanced Analytics”, John Wiley& sons,2012.
5. Glenn J.Myatt, “Making Sense of Data”, JohnWiley&Sons,2007.
6. Pete Warden, “Big Data Glossary”, O'Reilly,2011. Streams with 7. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, 2n Edition, Elsevier, Reprinted2008.

Web Links:

1. https://onlinecourses.nptel.ac.in/noc21_cs45/preview
2. https://archive.nptel.ac.in/courses/110/106/110106064/
3. https://onlinecourses.nptel.ac.in/noc22_cs65/preview?utm_source=chatgpt.com