AVANTHI INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

(Approved by A.I.C.T.E., New Delhi &Permanently Affiliated to JNTU-GV, Vizianagaram)
NAAC Accredited with A+ grade
Tamaram (V), Makavarapalem, Narsipatnam (RD), Anakapalle Dist,Pin-531113

DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS

ACADEMIC REGULATIONS

COURSE STRUCTURE AND SYLLABUS

For PG-R24

MCA – MASTER OF COMPUTER APPLICATIONS

(Applicable for batches admitted from 2024-2025)

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ACADEMIC REGULATIONS (R24) for
MASTER OF COMPUTER APPLICATIONS

(Applicable for the students of MCA from the AcademicYear2024-2025onwards)

1. Eligibility for Admissions

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

b) 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 APSCHE / Govt. of AP or on the basis of any other order of merit as approved by the JNTU-GV / Institute, subject to reservations as laid down by the Govt. from time to time.

2. Award of MCA Degree

a) 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.

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

c) The minimum instruction days in each semester are 90.

d) 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:

1HourLecture(L)per week	1Credit
1HourTutorial(T)per week	1Credit
1HourPractical (P)per week	0.5Credit
2HoursPractical(Lab) perweek	1Credit

3. Attendance

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

b) A student is eligible to write the Institute examinations if he acquires a minimum of40% in each subject and 75% of attendance in aggregate of all the subjects.

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

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

e) Shortageofattendancebelow65%inaggregateshall in **NO case be condoned and not eligible to write their end semester examination of that class.**

f) A candidate shall not be promoted to the next semester unless; he fulfills the attendance requirements of the previous semester.

g) A stipulated fee of Rs 1000/- shall be payable towards condonation fee for shortage of attendance. Students availing condonation on medical ground shall produce a medical certificate issued by the competitive authority.

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

4. Evaluation

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

Continuous Internal Evaluation:

Theory

(a) For theory subjects, during a semester, there shall be two mid-term examinations. Each mid term examination shall be conducted for a total duration of 120 minutes with 4 questions (without choice) each question for 10marks,and it will be reduced to 30 marks.

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

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

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

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

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

(g) Internal marks can be calculated with 80% weightage for better of the two MID and 20%weightagefor another MID exam.

(h) With the above criteria, institute examination section will send mid marks of all subjects inconsolidatedformtoalltheconcernedcollegesandsameshallbedisplayedintheconcerned college notice boards. If any discrepancy found, it shall be brought to the notice of institute examination section through proper channel within one week with all proofs. Discrepancies brought after the givendeadlinewillnotbeentertainedunderanycircumstances

End Semester Theory Examination Evaluation :

Theory:

Theendsemesterexaminationsshallbeconductedbytheinstituteexaminationsectionfor70 marks consists of five questions carrying 14 marks each. Each of these questions may contain sub-questions. For each question there will be an “either” “or” choice, which means that there will be two questions from each unit and the student should answere it her of the two questions.

Laboratory Evaluation:

i. **Internal Evaluation:** 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 20marksto be awarded by conducting an internal laboratory test.

ii. **External Evaluation:** For external marks for laboratory are 70 and marks shall be awarded based on the performance in the end laboratory examinations. Laboratory examination must be conducted with two Examiners, one of them being the Laboratory Class Teacher and the second examiner shall be appointed by the institute from the panel of examiners submitted

by the respective college. Laboratory examination must be conducted with a breakup marks of Procedure-20, Experimentation-25, Results-10, Viva-voce-15.

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

For Socially Relevant Project using design thinking and Employability Skills the evaluation will be for 25 marks internally at the end of the Semester by the departmental committee. A candidate has to secureaminimum50% of marks to be declared successful.

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 8 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 2 credits. The Head of the department shall notify the list of such courses at the beginning of the semester. The details of the MOOCs courses registered by the students shall be submitted to the institute examination center as well as college examination center. 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 submit all the assignments given and needs to take final exam at the proctor center. 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 maybe registered again through SWAYAM/NPTEL in the next semester with the recommendation of HOD and shall be passed.

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 aminimumaggregate of 50% of the total marks in the End Semester Examination and Internal Evaluation taken together.

In case the candidate does not secure the minimum academic requirement in any subject (as specified in4.7) he has to reappear for the End semester Examination in that subject. A candidate shall be given one chance to re-register for each subject provided the internal marks secured by a candidate are less than 50% and has failed in the end examination. In such a case, the candidate must re-register for the subject(s) and secure the required minimum attendance. The candidate's attendance in the re-registered subject(s) shall be calculated separately to decide upon his

eligibility for writing the end examination in those subject(s).In the event of the student taking another chance, his internal marks and end examination marks obtained in the previous attempt are nullified. For re-registration the candidates have to apply to the Institute through the college by paying the requisite fees and get approval from the Institute before the start of the semester in which re-registration is required. At a given time a candidate is permitted to re-register for maximum of two subjects in addition to the subjects of regular semester.

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

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

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

5 Evaluation of Project/ Dissertation Work

Everycandidateshallberequiredtosubmitathesisordissertationonatopicapproved bytheProject Review Committee.

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

If a candidate wishes to change his supervisor or topic of the project, he can do so with the approval of the Project Review Committee (PRC). However, the Project Review Committee(PRC)shallexaminewhetherornotthechangeoftopic/supervisorleadstoa 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.

The work on the project shall be initiated at the beginning of the Sixth semester and the duration of the project is one semester. A candidate is permitted to submit Project Thesis only after the approval of PRC not earlier than 20 weeks from the date of registration of the project work. The candidate has to pass all the theory and practical subjects before submission of the Thesis. For the approval of PRC the candidate shall submit the draft copy of thesis to the Principal(through Head of the Department) and shall make an oral presentation before the PRC.

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 Institute. For this, the Principal of the College shall submit a panel of 5 examiners, eminent in that field, with the help of the guide concerned and head of the department.

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

The project within the stipulated time after taking the approval from the Institute.

If the report of the examiner is favorable, a board consisting of the Supervisor, Head of the Department and the examiner approved by the Institute who adjudicated the thesis shall conduct Viva-Voce examination. The Board shall jointly report the candidate's work for a **maximum of100 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.

5 Cumulative Grade Point Average(CGPA)

As measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades and corresponding percentage of marks shall be followed: **A**fter each course is evaluated for 100 marks, the marks obtained in each course will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained

by the student fall.

Structure of Grading of Academic Performance

Marks Range(Max –100)	Level	Letter Grade	Grade Point
≥90	Superior	S	10
≥80to<89	Excellent	A	9
≥70to<79	Very Good	B	8
≥60to<69	Good	C	7
≥50to<59	Average	D	6
<50	Fail	F	0
-	Absent	AB	0

i) A student obtaining Grade "F" or Grade "Ab" in a subject shall be considered failed and will be required to reappear for that subject when it is offered the next supplementary examination.

ii) For non-credit audit courses, "Satisfactory" or "Unsatisfactory" shall be indicated instead of The letter grade and this will not be counted for the computation of SGPA /CGPA / Percentage.

Computation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average(CGPA): The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses under gone by a student, i.e.,

$$\mathbf{SGPA=\Sigma(C_i \times G_i)/\Sigma C_i}$$

Where, C_i is the number of credits of the i^{th} subject and G_i is the grade point scored by the student in the i^{th} course.

The Cumulative Grade Point Average(CGPA) will be computed in the same manner considering all the courses under gone by a student overall the semesters of a program,i.e.

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

Where "S_i" is the SGPA of the i^{th} semester and C_i is the total number of credits up to that semester. Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts. While computing the SGPA the subjects in whom the student is awarded Zero grade points will also be included.

Equivalent Percentage=(CGPA-0.75)*10

Grade Point: It is a numerical weight allotted to each letter grade on a10-point scale. Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by the letters S, A,

B, C, D and F.

6 Award of Degree and Class

After a student has satisfied the requirements prescribed for the completion of the program and iseligiblefortheawardofM.C.A.Degreeheshallbeplacedinoneofthefollowingfour classes:

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

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

7 With-holding of Results

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

8 Transitory Regulations

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

There admitted students will be governed by the regulations under which the candidate has been admitted.

9 Minimum Instruction Days

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

10 General

a) Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.

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

c) In the case of any doubt or ambiguity in the interpretation of the above rules/regulations, the decision of the Principal/ Dean-Academics of the institution is final.

d) The Institute 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 Institute.

MALPRACTICES RULES

DISCIPLINARY ACTION FOR/IMPROPER CONDUCT IN EXAMINATIONS

S.No	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1	(a) Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination) (b) Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsionfromtheexaminationhallandcancellationoftheperformanceinthatsubject only of all the candidates involved. Incase of an outsider, he will be handed over to the police and a case is registered against him.
2	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of

		That Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits these at. The performance of the original candidate, 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 candidate is also debarred for two consecutive semesters from class work and all External examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with for feiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all External examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with for feature of seat.
5	Uses objectionable, abusiveor offensive language in the answer paper or in letters to the examiners or writes to the examiner	Cancellation of the performance in that subject.

	Requesting him to award pass marks.	
6	Refuses to obey the orders of the Chief Superintendent/Assistant–Superintendent/ any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, as saults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of mis conductor mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shallbeexpelledfromexaminationhallsandcancellationoftheirperformanceinthatsubjectandallothersubjectsthecandidate(s)has(have) alreadyappearedand shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all External examinations. The continuation of the course by the candidate is subject to the Academic regulations in connection with for feature of seat.
8	Possess any lethal weapon or fire armin the examination hall.	Expulsion from the examination hall and cancellation of the performance in that

		subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/ year. The candidate is also debarred and forfeits the seat.
9	If student of the college, who is no a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s)who do not belong to the College will be handed over to police and, a police case will be registered against them.
10	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/ year.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Institute for further action to award suitable punishment	

Malpractices identified by squad or special invigilators

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

(Dr. R Prasad Rao)
Dean (Academics)&
Member Secretary(AC)

(Dr. C PV N J Mohan Rao)
Chairman
Academic Council

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DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS

Proposed Course Structure: Program– M.C.A (Master of Computer Applications)
(Applicable from the academic year 2024-2025 to 2025-2026)

I Semester- Course Structure **Regulations: R24**

S.No	Course Code	Course Title	Category	Hours per Week			Credits
				Lecture	Tutorial	Practical	
1	24F00HS01	Business Communication	HS	2	0	0	2
2	24F00HS02	Mathematical and Statistical Foundations	HS	3	0	0	3
3	24F00PC01	Computer Organization & Operating Systems	PC	3	0	0	4
4	24F00PC02	Data Structures	PC	3	0	0	3
5	24F00PC03	Object Oriented Programming with JAVA	PC	3	0	0	3
6	24F00PC04	Operating Systems and Linux Lab	PC	0	0	3	1.5
7	24F00PC05	Data Structures Lab	PC	0	0	3	1.5
8	24F00PC06	JAVA Programming Lab	PC	0	0	3	1.5
9	24F00MC01	Socially Relevant Project using Design Thinking	MC	0	0	1	0.5
Total				**15**	**1**	**10**	**20**

Category	Courses	Credits
PC: Professional Core Course	3	10
HS: Humanities, Management and Social Science	2	5
MC: Mandatory Course	1	0.5
LB: Laboratory	3	4.5
Total	9	20

DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS

. Proposed Course Structure: Program– M.C.A (Master of Computer Applications)
(Applicable from the academic year 2024-2025 to 2025-2026)

II Semester- Course Structure **Regulations: R24**

S.No	Course Code	Course Title	Category	Hours per Week			
				Lecture	Tutorial	Practical	Credits
1	24F00PC07	Database Management Systems	PC	3	0	0	3
2	24F00PC08	Computer Networks	PC	3	0	0	3
3	24F00PC09	Software Engineering and Design Patterns	PC	3	0	0	3
4	24F00PC10	Data Warehousing and Mining	PC	3	0	0	3
5	24F00PE01.1 24F00PE01.2 24F00PE01.3 24F00PE01.4 24F00PE01.5	**Elective-I** • No SQL Databases • Design and Analysis of Algorithms • Mobile Application Development • Artificial Intelligence • Accounting for Managers	PE	3	0	0	3
6	24F00PC11	DBMS Lab	PC	0	0	3	1.5
7	24F00PC12	Computer Networks Lab	PC	0	0	3	1.5
8	24F00PC13	Software Engineering and Design Patterns Lab	PC	0	0	3	1.5
9	24F00MC02	Employability Skills	MC	0	0	1	0.5
10	24F00MC03	Bridge Course (Python Programming To be taken through MOOCs)	MC	0	0	0	0
Total				**15**	**0**	**10**	**20**

Category	Courses	Credits
PC: Professional Core Course	4	12
PE: Professional Elective	1	3
LB: Laboratory	3	4.5
MC: Mandatory Course	2	0.5
Total	10	20

BUSINESS COMMUNICATION

I M.C.A- I SEMESTER

Course Title :**Business Communication**	Course Code: **24F00HS01**
Teaching Scheme (L:T:P): 2:0:0	Credits: 2
Type of Course: Lecture	
Continuous Internal Evaluation: 30 Marks	Semester End Exam: 70 Marks
Pre requisites:	

Course Overview: In a Business Communications degree program, students acquire a diverse set of skills that are crucial for effective communication within a business environment. Here are some of the key skills learned, along with brief descriptions:

- Written Communication: Students learn to craft clear, concise, and persuasive written messages tailored to different audiences. This includes writing business reports, emails, press releases, marketing materials, and social media content.

Course Objectives:

1. 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.
2. Enable students to develop new perspectives and equip themselves to meet the demands of a fast-changing world where technology and globalization and other forces have dramatically changed the practice of business communication in recent years
3. Enhance proficiency and competencies in verbal and non- verbal communication skills with a holistic long-term perspective
4. Guide the participants to manage cross cultural communication
5. Develop technical communication skills

CO#	Course Outcomes
CO1	To demonstrate the use of basic and advanced business writing skills.
CO2	To produce clear and concise written business documents.
CO3	To employ proper public speaking techniques
CO4	To develop and deliver a formal presentation.
CO5	To progress the interpersonal communications skills those are required for social and business interaction.

COURSE CONTENT (SYLLABUS)

UNIT I: **9 Hours**

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- Concepts and factors of Personality development- Personality Traits and its Values and ideals. **COs-C01**

UNIT II: **12 Hours**

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 **COs-C02**

UNIT III: **10 Hours**

Non-verbal communication and Body Language: Kinesics, Proxemics, Paralanguage, Haptics, handshakes, appropriate body language and mannerisms for interviews-Business etiquettes across different cultures. **COs-C03**

UNIT IV: **12 Hours**

Written communication: mechanics of writing, report writing- business correspondence-Business letter format- Meetings and managing meetings- Resume writing-Formats and Skills. **COs-C04**

UNIT V: **10 Hours**

Presentation skills: prerequisites of effective presentation, format of presentation- Assertiveness – strategies of assertive behavior -Communication skills for group discussion and interviews- Interview Techniques. **COs-C05**

Reference Books:

1) MallikaNawal:"BusinessCommunication",CengageLearning,NewDelhi,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 Rama krishnan, Business Communication, Himalaya Publishing House, Mumbai
5) Paul Turner:"*Organisational Communication*", JAICO Publishing House, New Delhi.
6) Sathya Swaroop Debasish, BhagabanDas""*Business Communication*", PHI Private Limited, New Delhi, 2009.
7) R.K.Madhukar:"Business Communication",VikasPublishingHouse,NewDelhi,2012
8) Kelly M Quintanilla, Shawn T.Wahl:"Business and Professional Communication", SAGE, New Delhi,2012.
9) Sangita Mehta, Neety Kaushish:"Business Communication", University Science Press, New Delhi,2010.
10) Anjali Ghanekar: "Business Communication Skills", Everest Publishing House, New Delhi, 2011.

Web References:

1) http://dx.doi.org/10.31521/modecon.v28(2021)-21.
2) http://dx.doi.org/10.1177/108056998905200113.
3) http://dx.doi.org/10.54783/ijsoc.v6i3.1197.

Mathematical and Statistical Foundations

I M.C.A- I SEMESTER

Course Title: **Mathematical and Statistical Foundations**	Course Code: **24F00HS02**
Teaching Scheme (L:T:P): 3:0:0	Credits: 3
Type of Course: Lecture	
Continuous Internal Evaluation: 30 Marks	Semester End Exam: 70 Marks
Pre requisites:	

Course Objectives:

1. Understand the mathematical fundamental that is prerequisites for variety of courses like Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems bioinformatics, Machine learning.
2. Develop the understand in gof the mathematical and logical basis to many modern techniques in computer science technology like machine learning, programming language design, and concurrency.
3. Study various sampling and classification problems.

CO#	Course Outcomes
C01	Apply the basic rules and theorems of probability theory such as Baye's Theorem; determine probabilities that help to solve engineering problems and to determine the expectation and variance of a random variable from its distribution.
C02	Able to perform and analyze of sampling, means, proportions, variances and estimates the maximum likelihood based on population parameters.
C03	Learn how to formulate and test hypotheses about sample means, variances and proportions and to draw conclusions based on the results of statistical tests.
C04	Design various ciphers using number theory.
C05	Apply graph theory for real-time problems like network routing problem.

COURSE CONTENT (SYLLABUS)

UNIT- I: **10 Hours**

Basic Probability and Random Variables: Random Experiments, Sample Spaces Events, the Concept of Probability the Axioms of Probability, Some Important Theorems on Probability Assignment of Probabilities, Conditional Probability Theorems on Conditional Probability, Independent Events, Bayes Theorem or Rule. Random Variables, Discrete Probability Distributions, Distribution Functions for Random Variables, Distribution Functions for Discrete Random Variables, Continuous Random Variables. **COs-CO1**

Self-Learning Topic**:** To understand risk and return on investment.

UNIT-II: **10 Hours**

Sampling and Estimation Theory: Population and Sample, Statistical Inference Sampling With and Without Replacement Random Samples, Random Numbers Population Parameters Sample Statistics Sampling Distributions, Frequency Distributions, Relative Frequency Distributions, Un biased Estimates and Efficient Estimates Point Estimates and Interval Estimates. Maximum Likelihood Estimates. **COs-CO2**

Self-Learning Topic: Computation of Mean, Variance, and Moments for Grouped Data**.**

UNIT-III: **10 Hours**

Tests of Hypothesis and Significance: Statistical Decisions Statistical Hypotheses. Null Hypotheses Tests of Hypotheses and Significance Type I and Type II Errors Level of Significance Tests Involving the Normal Distribution One-Tailed and Two-Tailed Tests, The Chi-Square Test for Goodness of Fit Contingency Tables Yates' Correction for Continuity Coefficient of Contingency. **COs-CO3**

Self-Learning Topic**:** Power of a Test Quality Control Charts Fitting Theoretical Distributions to Sample Frequency Distributions

UNIT-IV: **10 Hours**

Algebraic Structures and Number Theory: Algebraic Systems, Examples, General Properties, Semi Groups and Monoids, Homomorphism of Semi Groups and Monoids, Group, Subgroup, Abelian Group, Homomorphism, Isomorphism. Properties of Integers, Division Theorem, The Greatest Common Divisor, Euclidean Algorithm. **COs-CO4**

Self-Learning Topic**:** Modular Arithmetic (Fermat's Theorem and Euler's Theorem)

UNIT-V: **10 Hours**

Graph Theory: Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multi graphs, Planar Graphs, Euler's Formula, Spanning Trees, Algorithms for Spanning Trees (Problems Only and Theorems witho*ut* Proofs). **COs-CO5**

Self-Learning Topic**:** Graph Coloring and Covering, Chromatic Number.

Text Books:

1) Foundation Mathematics for Computer Science, 1stEdition, John Vince, Springer, 2015.
2) Probability & Statistics, 3rd Edition, Murray R.Spiegel, John J. Schiller and R.Alu Srinivasan, Schaum's Outline Series, Tata McGraw-Hill Publishers, 2018.
3) Probability and Statistics with Reliability, 2nd Edition, K. Trivedi, Wiley,2011
4) Discrete Mathematics and its Applications with Combinatorics and GraphTheory,7th
5) Edition, H.Rosen, Tata McGrawHill,2003

Reference Books:

1. Probability and Computing: Randomized Algorithms and Probabilistic Analysis,1st Edition, M. Mitzenmacher and E.Upfal, 2005.
2. Applied Combinatorics, 6thEdition, AlanTucker,Wiley,2012

Computer Organizations & Operating Systems

I M.C.A- I SEMESTER

Course Title : **Computer Organizations & Operating Systems**	Course Code: **24F00PC01**
Teaching Scheme (L:T:P): 3:1:0	Credits: 4
Type of Course: Lecture + Tutorial	
Continuous Internal Evaluation: 30 Marks	Semester End Exam: 70 Marks
Pre requisites:	

COURSE OBJECTIVES:

1. Conceptualize the basics of organization a land architectural issues of a digital computer.
2. Learn the function of each element of a memory hierarchy.
3. Study various data transfer techniques in digital computer.

CO#	Course Outcomes
CO1	Understand the basic organization of computer and different instruction formats and addressing modes
CO2	Analyze the concept of pipelining, segment register and pin diagram of CPU
CO3	Understand and analyze various issues related to memory hierarchy
CO4	Evaluate various modes of data transfer between CPU and I/O devices
CO5	Examine various inter connection structures of multi processors

COURSE CONTENT (SYLLABUS)

UNIT- I: Introduction: **15 Hours**

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

Machine Instructions and Programs: Numbers, Arithmetic Operations, and c Characters, Memory locations and addresses, Memory operations, Instructions and Instruction sequencing, Addressing Modes. **COs-CO1**

UNIT- II:

Processing Unit Fundamental Concepts: **15 Hours**

Register Transfers Language, Types of Registers, Register transfer Performing an Arithmetic or Logic Operation, Fetching a Word from Memory, Execution of Complete Instruction, Hardwired Control

Micro Programmed Control: Micro instructions, Microprogram Sequencing. **COs-CO2**

UNIT -III: Introduction to Operating System Concept: 15 Hours

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

Process Management: Process concept, Process State Diagram, Process control block, Process Scheduling, Inter process Communication, Threads- Threading Issues, Scheduling- Basic Concepts, Scheduling Criteria, Scheduling Algorithms COs-CO3

UNIT -IV: Process Synchronization: 12 Hours

The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitor

Principles of deadlock: System Model, Dead lock characterization, Deadlock handling, Deadlock Prevention, Detection and Avoidance. **COs-CO4**

UNIT -V: 15 Hours

Memory Management: Swapping, Contiguous Memory Allocation, Paging, structure of the Page Table, Segmentation Virtual Memory Management- Demand Paging, Page-Replacement Algorithms

File-System Interface: File Concept, Access Methods, Directory structure, File-System mounting, Files Sharing, Protection. File-System implementation- File-System Structure, Allocation Methods, Free-Space Management, Disk Structure, Disk Scheduling, Disk Scheduling Algorithms First-Come-First-Served (FCFS), Shortest Seek Time First (SSTF), SCAN, and C-SCAN. **COs-CO5**

Text Books:

1. Computer Organization, Carl Hamacher, ZvonksVranesic, SafeaZaky, 5th edition, McGrawHill.
2. Operating System concepts,7th edition, Abraham Siliberschatz, Galvin, JohnWiley & Sons, Inc
3. Advanced Programming in the Unix environment by W. Richard Stevens

Reference Books:

1. Computer Architecture and Organization, John P. Hayes, 3rdEdition, McGrawHill
2. Computer Organization and Architecture, William Stallings 6thEdition, Pearson / PHI
3. Operating Systems, 6th Edition, William Stallings, PHI/ Pearson
4. Unix and Shell Programming by B. M. Harwani, OXFORD University Press.

Web References:

1 https://www.geeksforgeeks.org/computer-organization-and-architecture-tutorials/?ref=lbp

2 https://www.jntufastupdates.com/jntuk-r20-2-1-operating-systems-material/

DATA STRUCTURES
I M.C.A- I SEMESTER

Course Title :**Data Structures**	Course Code: **24F00PC02**
Teaching Scheme (L:T:P): 3:0:0	Credits: 3
Type of Course: Lecture	
Continuous Internal Evaluation: 30 Marks	Semester End Exam: 70 Marks
Pre requisites:	

Course Overview :
In this course, you'll learn how to optimize your data analysis using data structures — and how to improve performance on common tasks like searching and sorting.

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.

CO#	Course Outcomes
CO1	Implement basic programs by using C concepts.
CO2	Select the data structures that efficiently model the information in a problem
CO3	Assess efficiency trade-offs among different at a structure implementations or combinations
CO4	Implement and know the application of algorithms for sorting and pattern matching.
CO5	Understand and describe the different sorting algorithms, including insertion sort, selection sort, bubble sort, quick sort, and merge sort, and explain their respective principles and use cases

COURSE CONTENT (SYLLABUS)

UNIT-I: Introduction to the 'C' Programming **15 Hours**

Introduction: Character set, Variables and Identifiers, Built-in Data Types, Input/output statements, Variable Definition, Arithmetic operators and Expressions, Constants and Literals, Simple assignment statement, Basic input/output statement, Type Casting and Type def Simple 'C' programs

Conditional Statements and Loops: Decision making within a program, Conditions, Relational Operators, Logical Connectives, if statement, if-else statement, Loops: while loop, do while, for loop, Nested loops, Infinite loops, Switch statement, Break statement, Goto statement.

Self-Learning Topics: Escape Sequences

Arrays, Strings and Functions:

Arrays: One dimensional array: Array manipulation; Searching, Insertion, Deletion of an element from an array; Finding the largest/smallest element in an array; two dimensional arrays with examples.

Strings: Concepts, String Types, String Input / Output functions, String manipulation functions, Null terminated strings as array of characters, Standard library string functions.

Functions: Top-down approach of problem solving, Modular programming and functions, Standard Library of C functions, Prototype of a function: Formal parameter list, Return Type, Function call, Block structure, passing arguments to a Function: call by reference, call by value, Recursive Functions, arrays as function arguments. **COs-C01**
Self-Learning Topics: String Pattern Matching

UNIT-II: Storage Classes & Structures and Unions 15 Hours
Storage Classes: Scope and extent, Storage Classes in a single source file: auto, extern and static, register, Storage Classes in multiple source files: extern and static
Structures and Unions: Structure variables, initialization, structure assignment, nested structure, structures and functions, structures, and arrays: arrays of structures, structures containing arrays, unions, Enumeration.
Self-Learning Topics: How do you pass a structure to a function
Pointers & File Processing
Pointers: Address operators, pointer type declaration, pointer assignment, pointer initialization, pointer arithmetic, functions and pointers, Arrays and Pointers, pointer arrays, pointers and structures, dynamic memory allocation.
File Processing: Concept of a file, streams, text files and binary files, Differences between text and binary files, State of a file, Opening and Closing files, file input/output functions (standard library input/output functions for files), file status functions (error handling), Positioning functions.
COs-C02
Self-Learning Topics: Binary Files and operations on Binary files

UNIT-III: 15 Hours
Data structure: Definition, types of data structures, Recursion Definition, Linear and binary recursion. Preliminaries of algorithms, analysis and complexity .Linear list – singly linked list, Double linked list and circular linked list - implementation, insertion, deletion and searching operations on linear list. **COs-C03**

UNIT-IV: 15 Hours
Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations. Hash Table Representation: hash functions, collision resolution- separate chaining, open addressing-linear probing, quadratic probing, double hashing and rehashing, extendible hashing. **COs-C04**

UNIT-V: 15 Hours
Sorting Techniques: Insertion sort, selection sort, exchange-bubble sort, quick sort and merge sort Algorithms. Trees: Binary Trees, terminology, representation and traversals- pre, post & in order traversals. Search Trees: Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion. **COs-C05**

Text Books:

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

Reference Books:

1. Data Structures: APseudo code Approach with C, 2ndEdition, R. F.Gilberg and B.A. Forouzan, Cengage Learning.
2. Programming in ANSI C, 5th edition, E. Balaguruswamy, TMH

Web References:

1. http://www.hackerrank.com/domains/datastructures
2. http://www.github.com/topics/data_structures_c
3. http://nptel.ac.in/courses
4. http://www.cslibrary.stanford.edu

OBJECT ORIENTED PROGRAMMING WITH JAVA
I M.C.A- I SEMESTER

Course Title**: Object Oriented Programming With Java**	Course Code: **24F00PC03**
Teaching Scheme (L:T:P): 3:0:0	Credits: 3
Type of Course: Lecture	
Continuous Internal Evaluation: 30 Marks	Semester End Exam: 70 Marks
Pre requisites:	

COURSE OVERVIEW: Object-oriented programming aims to implement real-world entities like inheritance, hiding, polymorphism etc. in programming. OOP stands for Object-Oriented Programming.
Procedural programming is about writing procedures or methods that perform operations on the data.

COURSE OBJECTIVES:

1. To understand the basic concepts of object oriented programming concepts.
2. To introduce the principles of inheritance and polymorphism and demonstrate how they are related to the design of abstract classes
3. To understand the implementation of packages and interfaces
4. To introduce the concept of multithreading and exception handling
5. To learn and understand the design of Graphical User Interface using swing controls

COURSE OUTCOMES:

CO#	Course Outcomes
CO1	Describe the uses OOP concepts
CO2	Apply OOP concepts to solve real world problems
CO3	Distinguish the concept of packages and interfaces
CO4	Demonstrate the exception handing, multithread applications with synchronization
CO5	Design the GUI based applications using AWT and Swings Establishing Java Database Connection

COURSE CONTENT (SYLLABUS)

UNIT-I: **15 Hours**

Object-Oriented Programming: Introduction, Object Oriented paradigm, Basic Concepts of OOP, Benefits of OOP, Applications of OOP
Java Basics: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style. Data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and costing, simple java program
Classes and objects: concepts of classes, objects, constructors methods, access control, this

keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, string handling. **COs-C01**

UNIT-II: **15 Hours**

Inheritance: Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance- specialization, specification, construction, extension, limitation, combination, Types of Inheritance, benefits of inheritance costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism, abstract classes.

Packages and Interfaces: Defining, Creating and Accessing a package, Importing packages, differences between classes and interfaces, defining an interface, Implementing interface, applying interfaces variables in interface and extending interfaces. **COs-C02**

UNIT-III: **15 Hours**

Exception handling and Multithreading: Concepts of exception handling, benefits of exception handling, exception hierarchy, usage of try, catch, throws and finally, built in exceptions, creating own exception sub classes. Differences between multi threading and multitasking, thread life cycle, creating threads, synchronizing threads, daemon threads, thread groups.

COs-C03

UNIT-IV: **15 Hours**

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes, inner classes. The AWT class hierarchy , user- interface components- labels, button, canvas, scrollbars, text components, check box, check box groups, choices, list panes- scroll pane, dialogs, menu bar, graphics, layout manager- layout manager types- boarder, grid, flow, card and grid bag. **COs-C04**

UNIT-V: **15 Hours**

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

JDBC Fundamentals: JDBC Overview, JDBC Components, JDBC Driver Registration, Establishing Connections. **COs-C05**

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
4) Introduction to Java programming, 6/e, Y.Daniel Liang, Pearson

Reference Books:

1) Core Java 2, Vol 1(Vol 2) Fundamentals(Advanced), 7/e, Cay.S.Horstmann, Gary Cornell, Pearson
2) Big Java2, 3/e, Cay.S. Horstmann, Wiley
3) Object Oriented Programming through Java, P.Radha Krishna, University Press
4) JAVA& Object Orientation an Introduction, 2/e, John Hunt, Springer

5) Introduction to JAVA Programming, 7/e, Y. Daniel Liang, Pearson. , TMH

Web References:

1. https://www.codecademy.com/courses/learn-java/lessons/hello-world-java/exercises/introduction-to-java
2. https://www.w3schools.com/java/java_variables.asp
   https://www.geeksforgeeks.org/java/

OPERATING SYSTEMS and LINUX LAB

I M.C.A- I SEMESTER

Course Title : **Operating Systems and Linux Lab**	Course Code: **24F00PC04**
Teaching Scheme (L:T:P): 0:0:3	Credits: 1.5
Type of Course: Practicals	
Continuous Internal Evaluation: 30 Marks	Semester End Exam: 70 Marks
Pre requisites:	

Course Overview:

- Introduction to Linux. Introduction to Linux Operating System. Linux Full Form. what are …
- Getting Started with Linux. How to install and Run Linux Software in Windows 10 using …
- Basic Linux Commands: Is cp touch. man. cal. pwd mv ln grep wc mkdir rm cat. echo df cd …
- Linux File System. Linux File Hierarchy Structure. Linux Directory Structure.

Course Objectives:

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

CO#	Course Outcomes
CO1	Implement various CPU scheduling algorithms and compare results
CO2	Implement various disk scheduling algorithms and compare results
CO3	Implement page replace algorithms
CO4	Implement various memory management techniques.
CO5	Execute basic Linux commands

Developing the following programs:

Operating Systems Lab

1. Simulate the Following CPU Scheduling Algorithms
   a) FCFS b) SJF c) Priority d) Round Robin

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

2. Simulate The Following
   a) Multiprogramming with A Fixed Number Of Tasks (MFT)
   b) Multiprogramming with A Variable Number Of Tasks (MVT)
3. Write a program to implement first fit, best fit and worst fit algorithm for memory management.
4. Simulate Bankers Algorithm for Dead Lock Avoidance
5. Simulate Bankers Algorithm for Dead Lock Prevention.

Linux Lab

1. Study of Unix/Linux general purpose utility commands
2. Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system.
3. C program to emulate the UNIX ls –l command
   a. Write a Shell program to check whether given number is prime or not.

4. Write a shell script which will display Fibonacci series up to the given range.
5. Write a shell script to check whether the given number is Armstrong or not.
6. Write a shell script to the calculate the value of
7. Write a shell script to accept student number, name, marks in 5 subjects.
   Find total, average and grade using the following rules:
   i. Avg>=80 then grade A
   ii. Avg<80&&Avg>=70 then grade B
   iii. Avg<70&&Avg>=60 then grade C
   iv. Avg<60&&Avg>=50 then grade D
   v. Avg<50&&Avg>=40 then grade E
8. Write a shell script to find minimum and maximum elements in the given list of elements.
9. Write a shell program to check whether the given string is palindrome or not.
10. Write a shell program to print sum, avg of students marks list
11. Write a shell script to check whether the given input number is prime or not.

Data Structures Lab
I M.C.A- I SEMESTER

Course Title : **Data Structures Lab**	Course Code: **24F00PC05**
Teaching Scheme (L:T:P): 0:0:3	Credits: 1.5
Type of Course: Practicals	
Continuous Internal Evaluation: 30 Marks	Semester End Exam: 70 Marks
Pre requisites:	

COURSE OBJECTIVES:

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

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

CO#	Course Outcomes
CO1	Implement various basic data structures and its operations
CO2	Apply sorting and searching algorithms to given numbers
CO3	Implement various tree operations.
CO4	Implement various graphs algorithms.
CO5	Develop applications using various data structures.

List of Experiments

Experiment 1:

a) Write a program in C to display the n terms of even natural number and their sum.
b) Write a program in C to display the n terms of harmonic series and their sum. 1 + 1/2 + 1/3 + 1/4+ 1/5 ... 1/n terms.
c) Write a C program to check whether a given number is an Armstrong number or not.
d) Write a C program to calculate the factorial of a given number.

Experiment 2:

a) Write a program in C for multiplication of two square Matrices.
b) Write a program in C to find transpose of a given matrix.

Experiment 3:

a) Write a program in C to check whether a number is a prime number or not using the function.
b) Write recursive program which computes the n^{th} Fibonacci number, for appropriate values of n.
c) Write a program in C to add numbers using call by reference.

Experiment 4:

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

Experiment 5:

a) Write recursive program for the following
b) Write recursive and non recursive C program for calculation of Factorial of an integer.
c) Write recursive and non recursive C program for calculation of GCD (n, m)
d) Write recursive and non recursive C program for Towers of Hanoi: N disks are to be transferred from peg S to peg D with Peg I as the intermediate peg.

Experiment 6:

a) Write 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 7:

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

Experiment 8:

a) Write a C program that uses Stack operations to convert infix expression into postfix expression.
b) Write C program that implement Queue (its operations) using arrays.
c) Write C program that implement Queue (its operations) using linked lists.

Experiment 9:

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

Experiment 10:

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

Experiment 11:

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

Experiment 12:

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

Experiment 13:

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

Experiment 14:

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

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

Exercise Problems:

1. Write a program to declare variables of different data types (int, float, char, double) and initialize them. Print the values of these variables.
2. Create a C program that reads two integers from the user and performs addition, subtraction, multiplication, and division. Display the results.
3. Write a program that demonstrates type casting between different data types. For example, cast a float to an int and display the result.
4. Implement a C program that takes user input for a name and age, and prints a personalized message.
5. Write a program that uses if-else statements to check if a given number is positive, negative, or zero.
6. Create a program that prints the first 10 natural numbers using a for loop.
7. Write a program that prints a multiplication table (1 to 10) using nested loops.
8. Implement a simple calculator using a switch statement that can perform addition, subtraction, multiplication, and division based on user input.
9. Write a program that initializes an array of 5 integers, performs insertion of a new element, searches for an element, and deletes an element.
10. Implement a program that finds the largest and smallest elements in an array of integers.
11. Write a program that reverses a given string and prints the reversed string.
12. Create a program that uses standard library functions like strlen, strcmp, and strcpy to perform string operations.
13. Implement a function that calculates the factorial of a number using recursion.
14. Write a function that accepts two integers and returns their sum. Use this function in a main program to display the result.
15. Demonstrate the difference between call by value and call by reference using appropriate functions.
16. Write a program that demonstrates the use of auto, static, extern, and register storage classes.
17. Define a structure to store student information (name, roll number, and marks). Write a program to input and display student details using this structure.
18. Create a structure for an employee with nested structures for address details. Write a program to input and display employee information.
19. Write a program that demonstrates the use of unions by storing and displaying different types of data (e.g., int, float, char) using a single memory location.
20. Implement a singly linked list with operations to insert, delete, and search for nodes.
21. Create a doubly linked list and implement insertion and deletion operations from both ends.
22. Write a program that creates a circular linked list and performs insertion and deletion operations.
23. Implement a recursive function to calculate the factorial of a number.
24. Write a recursive function to generate the nth Fibonacci number.

25. Implement a stack using an array and perform push, pop, and display operations.
26. Write a program to implement a stack using a linked list.
27. Create a queue using an array and implement enqueue, dequeue, and display operations.
28. Implement a queue using a linked list with basic operations.
29. Implement a hash table using separate chaining for collision resolution.
30. Write a program that demonstrates hash table implementation with open addressing (linear probing).
31. Implement the following sorting algorithms in C: insertion sort, selection sort, bubble sort, quick sort, and merge sort.
32. Write a program that compares the efficiency of different sorting algorithms using randomly generated data.
33. Implement a binary tree with operations for insertion, deletion, and traversal (pre-order, in-order, post-order).
34. Create a binary search tree (BST) and perform search, insertion, and deletion operations.
35. Write a program that demonstrates different tree traversal methods (pre-order, in-order, post-order) on a binary tree.

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, 2nd ed, Mark Allen Weiss

Reference Books:

1) Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B.A. Forouzan, Cengage Learning.
2) Programming in ANSI C, 5th ed, E. Balaguruswamy, TMH

JAVA PROGRAMMING LAB

I M.C.A- I SEMESTER

Course Title : **Java Programming Lab**	Course Code: 24F00PC06
Teaching Scheme (L:T:P): 0:0:3	Credits: 1.5
Type of Course: Practicals	
Continuous Internal Evaluation: 30 Marks	Semester End Exam: 70 Marks
Pre requisites:	

COURSE OBJECTIVES:

1. To understand how to design, implement, test, debug, and document programs that use basic data types and computation, simple I/O, conditional and control structures, string handling and functions.
2. To understand the importance of Classes & objects along with constructors, Arrays and Vectors.
3. Discuss the principles of inheritance, interface and packages and demonstrate though problem analysis assignments how they relate to the design of methods, abstract classes and interfaces and packages.
4. To understand importance of Multi-threading & different exception handling mechanisms.
5. To learn experience of designing, implementing, testing, and debugging graphical user interfaces in Java using applet and AWT that respond to different user events.
6. To understand Java Swings for designing GUI applications based on MVC architecture.

CO#	Course Outcomes
CO1	Apply OOP concepts to solve real-world problems
CO2	Implement different forms of inheritance
CO3	Create packages and to reuse them.
CO4	Implement multi threaded programs using synchronization concepts
CO5	Create user defined exceptions and Design GUI applications using AWT and SWINGS.

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 for sorting a given list of names in ascending order.
5. Write a Java Program that illustrates how runtime polymorphism is achieved.
6. Write a Java Program to create and demonstrate packages.
7. Write a Java Program, using String Tokenize class, which reads a line of integers and then displays each integer and the sum of all integers.

8. Develop a Java application that demonstrates comprehensive file handling operations. The application should perform the following tasks:
   - Create a new file
   - Read the contents of the file and display it on the console.
   - Append additional text to the existing content of the file.
   - Copy the contents of the original file to a new file.
   - Delete the original file
9. Write a Java Program that displays the number of characters, lines and words in a text/text file.
10. Design a Java Swing form with two text fields, a "Submit" button, and a label. When the "Submit" button is clicked, the text from the two text fields should be concatenated and displayed in the label. Implement the event handling for the button click.
11. Write a Java Program for handling mouse events.
12. Write a Java Program demonstrating the life cycle of a thread.
13. Write a Java Program that lets users create Pie charts. Design your own user interface (with Swings & AWT).
14. Write a Java Program to implement a Queue, using user defined Exception Handling (also make use of throw, throws).
15. Write a Java program to establish a connection to a database and verify the connection.

SOCIALLY RELEVANT PROJECT USING DESIGN THINKING
I M.C.A- I SEMESTER

Course Title : **SOCIALLY RELEVANT PROJECT USING DESIGN THINKING**	Course Code: **24F00MC01**
Teaching Scheme (L:T:P): 0:0:1	Credits: 0.5
Type of Course: SOC	
Continuous Internal Evaluation: 0 Marks	Semester End Exam: 25 Marks
Pre requisites:	

COURSE OBJECTIVES:

- Build mind sets & foundations essential for designers
- Learn about the Human-Centered Design methodology and understand the in real-world applications
- Use Design Thinking for problem solving methodology for investigating ill defined problems.

  Under go several design challenges and work to wards the final design challenge

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

CO#	Course Outcomes
CO1	Project Stream1:Electronics,Robotics,IOT and Sensors
CO2	ProjectStream2:Computer Science and IT Applications
CO3	ProjectStream3:Mechanical and Electrical tools
CO4	ProjectStream4:Eco-friendly solutions for waste management, infrastructure, safety, alternative energy sources, Agriculture, Environmental science and other fields of engineering.

How to Pursue The Project Work?

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

Tasks to be done:

Task 1:Every one is a Designer

- Understand class objectives &harness the designer mindset Task 2: The Wallet/Bag Challenge and Podcast
- Gain a quick introduction to the design thinking methodology
- Go through all stages of the methodology through as impled design challenge
- Podcast: Observe, Listen and Engage with the surrounding environment and identify a design challenge.

Task 3:Teams&Problems

- Start Design Challenge and learn about teams &problems through this
- Foster team collaboration, find inspiration from the environment and learn how to identify problems

Task 4: Empathizing

- Continue Design Challenge and learn empathy
- Learn techniques on how to empathize with users
- Go to the field and interview people in their environments
- Submit ActivityCard Task 5: Ideating
- Continue Design Challenge and learn how to brain storm effectively
- Encourage exploration and foster spaces for brain storming
- Submit ActivityCard Task 6: Prototyping
- Continue Design Challenge and learn how to create effective prototypes
- Build tangible models and use them as communication tools
- Start giving constructive feedback to classmates and teammates
- Submit ActivityCard Task 7: Testing
- Finish Design Challenge and iterate prototypes and ideas through user feedback
- Evolve ideas and prototypes through user feedback and constructive criticism
- Get peer feedback on individual and group performance
- Submit ActivityCard Task 8:
- Final Report Submission and Presentation

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

References:

1. TomKelly,TheArtofInnovation:LessonsinCreativityFromIDEO,America'sLeading Design Firm (Profile Books, 2002)
2. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation (Harper Business, 2009)
3. Jeanne Liedtka, Randy Salzman, and DaisyAzer,Design Thinking for the GreaterGood: Innovation in the Social Sector (Columbia Business School Publishing, 2017)

Other Useful Design Thinking Frameworks and Methodologies:

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

DATA BASE MANAGEMENT SYSTEMS
I M.C.A- II SEMESTER

Course Title: **DATA BASE MANAGEMENT SYSTEMS**	
Teaching Scheme (L:T:P): 3:0:0	Course Code: **24F00PC07**
Type of Course: Lecture	Credits: 3
Continuous Internal Evaluation: 30 Marks	Semester End Exam: 70 Marks
Pre requisites:	

COURSE OVERVIEW:

DBMSs facilitate data storage, retrieval, and management, providing essential support for decision-making and operational processes in organizations.

They enable scalability, security, and integrity of data, crucial for modern applications and business environments.

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.

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

COURSE OUTCOMES:

CO#	Course Outcomes
CO1	Illustrate the concept of databases, database management systems, database languages, database structures and their work
CO2	Apply ER modeling and Relational modeling for designing simple databases.
CO3	Summarize the concepts related to relational model and SQL and Write database queries using relational algebra and structured query language.
CO4	Design and develop databases from the real world by applying the concepts of Normalization.
CO5	Outline the issues associated with Transaction Management and Recovery, Tree Structured and Hash-Based Indexing

COURSE CONTENT (SYLLABUS)

UNIT-I: **15 Hours**

Databases and Database Users: Introduction, Characteristics of the Database Approach, Actors on the Scene, Workers behind the scene, Advantages of the using the DBMS Approach.

Database System Concepts and Architecture: Data Models, Schemas and Instances, Three Schema architecture and Data Independence, Database Languages and Interfaces, Centralized and Client/Server Architecture for DBMS, Classification of Database Management Systems.

COs-C01

UNIT-II: **15 Hours**

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, Conceptual Design for Large Enterprises

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. **COs-C02**

UNIT-III: **15 Hours**

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

Relational Calculus : Types of Relational Calculus, Functional Dependency, Inference Rule

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

COs-C03

UNIT-IV: **15 Hours**

Introduction to Normalization Using Functional and Multivalued Dependencies: Informal 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. **COs-C04**

UNIT-V: **15 Hours**

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. **COs-C05**

Note: For Practical Examples Please Go Through Reference 1

Text Books:

1) Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, Mc Graw-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) Database Systems, 9/e, Carlos Coronel, Steven Morris, Peter Rob, Cengage
2) Introduction to Database Systems, 8/e, C J Date, Pearson

Web references:

1. https://www.geeksforgeeks.org/dbms/
2. https://www.javatpoint.com/dbms-tutorial

COMPUTER NETWORKS
I M.C.A- II SEMESTER

Course Title: **COMPUTER NETWORKS**	Course Code: **24F00PC08**
Teaching Scheme (L:T:P): 3:0:0	Credits: 3
Type of Course: Lecture	
Continuous Internal Evaluation: 30 Marks	Semester End Exam: 70 Marks
Pre requisites:	

COURSE OVERVIEW: Computer networks enable communication, resource sharing, and collaboration, making them essential for personal, educational, and business environments. They form the backbone of the modern digital world, supporting everything from social media to cloud services.

COURSE OBJECTIVES:

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

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

COURSE OUTCOMES:

CO#	Course Outcomes
CO1	Explain the network architecture, TCP/IP and OSI reference models
CO2	Identify and understand various techniques and modes of transmission
CO3	Describe routing and congestion in network layer with routing algorithms and classify IPV4 addressing scheme
CO4	Discuss the elements and protocols of transport layer
CO5	Develop network security and define various protocols such as FTP, HTTP, Telnet, DNS

COURSE CONTENT (SYLLABUS)

UNIT-I: **10 Hours**

Introduction: Network Topologies WAN, LAN, MAN. Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models. **Physical Layer –**Introduction to physical layer-Data and Signals, Periodic analog signals, digital signals, transmission impairment, ,Data rate limits, performance -Introduction to Guided Media-Twisted-pair cable, Coaxial cable and Fiber optic cable and Unguided media: Wireless-Radio waves, microwaves, infrared. **COs-C01**

UNIT-II: **15 Hours**

The Data Link Layer - Services Provided to the Network Layer – Framing – Error Control – Flow Control, Error Detection and Correction – Error-Correcting Codes – Error Detecting Codes. **Elementary Data Link Protocols-** A Utopian Simplex Protocol-A Simplex Stop and Wait

Protocol for an Error free channel-A Simplex Stop and Wait Protocol for a Noisy Channel, Sliding Window Protocols-A One Bit Sliding Window Protocol-A Protocol Using Go-Back-N- A Protocol Using Selective Repeat. **COs-C02**

UNIT-III: **15 Hours**

The Network Layer Design Issues – Store and Forward Packet Switching-Services Provided to the Transport layer- Implementation of Connectionless Service-Implementation of Connection Oriented Service- Comparison of Virtual Circuit and Datagram Networks, Routing Algorithms-The Optimality principle-Shortest path, Flooding, Distance vector, Link state, Hierarchical. Congestion Control algorithms-General principles of congestion control, Congestion prevention polices, Approaches to Congestion Control-Traffic Aware Routing- Admission Control-Traffic Throttling-Load Shedding. **COs-C03**

UNIT-IV: **10 Hours**

Internet Working: How networks differ- How networks can be connected- Tunneling, internetwork routing-, Fragmentation, network layer in the internet – IP protocols-IP Version 4 protocol-, IP addresses-, Subnets-IP Version 6-The main IPV6 header- Internet control protocols-ICMP-ARP- DHCP. **COs-C04**

UNIT-V: **15 Hours**

The Transport Layer: Transport layer protocols: Introduction-services- port number-User data gram protocol-User datagram-UDP services-UDP applications-Transmission control protocol: TCP services- TCP features- Segment- A TCP connection- windows in TCP- flow control-Error control. **Application Layer –-** World Wide Web: HTTP , FTP-Two connections-control connection-Data connection-security of FTP-Electronic mail-Architecture- web based mail- email security- TELENET-local versus remote Logging. **Domain Name System:** Name Space, DNS in Internet, - Resolution-Caching- Resource Records- DNS messages- Registrars-security of DNS Name Servers, DNS Security. **COs-C05**

Text Books:

1) Computer Networks: Andrew S Tanenbaum David J. Wetherall, 5/e, Pearson
2) Data communications and networking: Behrouz Forouzan, 5/e, McGraw Hill

Reference Books:

1) Computer Networks – A System Approach, Peterson, Bruce Davie,2/e , Harcourt Asia
2) Compute communications and networking technologies, Gallo, Hancock, Cengage
3) An Engineering approach to compute networking, Kesha, Pearson

Web References:

1) https://www.geeksforgeeks.org/computer-network-tutorials/
2) https://www.tutorialspoint.com/computer_fundamentals/computer_networking.htm

Software Engineering and Design patterns
I M.C.A- II SEMESTER

Course Title: Software Engineering and Design Patterns	Course Code: **24F00PC09**
Teaching Scheme (L:T:P): 3:0:0	Credits: 3
Type of Course: Lecture	
Continuous Internal Evaluation: 30 Marks	Semester End Exam: 70 Marks
Pre requisites:	

Course Overview: This overview provides a foundational understanding of what a Software Engineering and Design Patterns course typically includes, preparing students for real-world software development challenges.

Course Objectives:

1. To understand the nature of software development and software life cycle models
2. To understand methods of capturing, specifying, visualizing and analyzing software requirements.
3. Understand the concept of Design patterns and its importance.
4. Understand the behavioral knowledge of the problem and solutions.
5. Relate the Creational, Structural, behavioral Design patterns.
6. Apply the suitable design patterns to refine the basic design forgiven context.

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

CO#	Course Outcomes
CO1	Define various software application domains and remember different process model used in software development.
CO2	Explain needs for software specifications also they can classify different types of software requirements and their gathering techniques.
CO3	Convert there requirements model into the design model and demonstrate use of software and user interface design principles.
CO4	Illustrate the appropriate design patterns to solve object-oriented design problems.
CO5	Evaluate the design solutions by using behavioral patterns and Apply structural patterns to solve design problems.

COURSE CONTENT (SYLLABUS)

UNIT-I: Introduction to Software Engineering **14 Hours**

The evolving role of software, Changing Nature of Software, Software myths. **The software problem:** Cost, schedule and quality, Scale and change. **Software Process:** Process and project, component software process, SDLC, **Software development process models:** Waterfall model, prototyping, iterative development, relational unified process, time boxing model, Extreme programming and agile process, Sprial Model **COs-CO1**

UNIT-II: **12 Hours**

Software requirement analysis and specification: Value of good SRS, requirement process, requirement specification, functional specifications with use-cases, **Planning a software project:** Effort estimation, project schedule and staffing, quality planning, risk management planning, project monitoring plan, detailed scheduling. **COs-CO2**

UNIT-III: Software Architecture **16 Hours**

Role of software architecture, architecture views, components and connector view, documenting architecture design, evaluating architectures, **Design:** Design concepts, function-oriented design, object oriented design, detailed design,

Software Testing: Introduction, verification and validation, White box and Black box techniques **COs-CO3**

UNIT-IV: Introduction: **12 Hours**

History and Origin of Patterns, Design Patterns in MVC, Describing Design Patterns, How Design Patterns Solve Design Problems, selecting a Design Pattern, Using a Design Pattern

DesignPatterns-1:Creational , Abstract Factory-Builder, Factory – Method, Prototype-singleton.

UNIT-V:

Design Patterns-2:Structural Patterns: Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy

Design Patterns-3: Behavioural Patterns, Chain of Responsibility, Command-Interpreter, Iterator-Mediator, Memento, Observer, State, Strategy, Template Method, Visitor **COs-CO4**

Text Books:

1. Software Engineering: A Practitioner's Approach, Roger S. Pressman, 10thed,Mc Graw Hill.
2. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, Design patterns: Elements of Reusable object-oriented software, Addison-Wesley, 1995.
3. James W Cooper, Java Design Patterns-A Tutorial, Addison-Wesley

Reference Books:

1. Software Engineering,8/e, Sommerville, Pearson
2. Software Engineering principles and practice, WS Jawadekar, TMH
3. Craig Larman, Applying UML and Patterns: An Introduction to object- Oriented Analysis and Design and iterative development,3rd Edition, Pearson,2005.
4. Thomas J Mowbray and Raphael Malveau, CORBA and Design Patterns, John Wiley, 1997.
5. William J Brown, Anti-Patterns: Refactoring Software, Architectures and Projects in Crisis, John Wiley, 1998.

Web References:

1. https://www.computer.org/education/bodies-of-knowledge/software-engineering
2. https://www.geeksforgeeks.org/software-engineering/?ref=lbpMartin Fowler’s Blog

Data Warehousing and Data Mining

I M.C.A- II SEMESTER

Course Title: **Data Warehousing and Data Mining**	Course Code: **24F00PC10**
Teaching Scheme (L:T:P): 3:0:0	Credits: 3
Type of Course: Lecture	
Continuous Internal Evaluation: 30 Marks	Semester End Exam: 70 Marks
Pre requisites:	

Course Overview: Data warehousing and data mining are complementary disciplines that play crucial roles in modern data management and analytics.

Together, they empower organizations to harness their data effectively, uncover valuable insights, and drive better business outcomes.

COURSE OBJECTIVES:

1. Be familiar with mathematical foundations of data mining tools..
2. Understand and implement classical models and algorithms in data warehouses and data mining
3. Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.
4. Develop skills in electing the appropriate data mining algorithm for solving practical problems.

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

CO#	Course Outcomes
CO1	Understand the basics of types of data, quality of data, suitable techniques required for preprocessing and measures required to perform data analysis
CO2	Describe the need of classification, identify suitable technique(s) to perform classification , model building and evaluation
CO3	Identify the requirements and usage of association rule mining on categorical and continuous data.
CO4	Evaluate clustering results and handle high-dimensional data challenges.
CO5	Describe the requirements and the need of web mining

COURSE CONTENT (SYLLABUS)

UNIT-I: **15 Hours**

Introduction to Data mining and Data preparation

Introduction to Data mining, Definition of Data and Data mining, types of Data, Data Quality, Data Processing, Measures of Similarity and Dissimilarity, Exploring Data: Data Set, Data Set Characteristics, Summary Statistics, Visualization, Data Warehouse, OLAP and multi-dimensional data analysis. **COs-C01**

UNIT-II: **15 Hours**

Classification: Basic Concepts, Decision Trees and model evaluation: General approach for solving a classification problem, Decision Tree induction, Regression, Type of Regression **Model over fitting:** due to presence of noise, due to lack of representation samples, Evaluating the performance of classifier. Nearest Neighborhood classifier, Bayesian Classifier, Support vector Machines: Linear SVM, Separable and Non Separable case. **COs-C02**

UNIT-III: **15 Hours**

Association Analysis: Problem Definition, Frequent Item-set generation, rule generation, compact representation of frequent item sets, FP-Growth Algorithms. Handling Categorical, Continuous attributes, Concept hierarchy, Sequential, Sub graph patterns. **COs-C03**

UNIT-IV: **15 Hours**

Clustering Techniques: Clustering Overview, Types of clustering, K-means, Agglomerative Hierarchical clustering, DBSCAN, **Cluster evaluation**: overview, Unsupervised Cluster Evaluation using cohesion and separation, using proximity matrix, Scalable Clustering algorithm. **COs-C04**

UNIT-V: **18 Hours**

Web data mining: Introduction, Web terminology and characteristics, Web content mining, Web usage mining, web structure mining, **Search Engines**: Characteristics, Functionality, Architecture, Ranking of Web pages, Enterprise search. **COs-C05**

Board of Studies : Master of Computer Applications
Approved in BOS No: 21, August, 2024
Approved in ACM No: 01

Text Books:

1) Introduction to Data Mining, Tan, Steinbach and Vipin Kumar, PearsonEducation,2016
2) Data Mining: Concepts and Techniques, 2nd Edition, JiaweiHan and Micheline Kamber, ELSEVIER

Reference Books:

1) Data Mining: The Textbook, Springer, May2015, Charu C.Aggarwal

Web References:

1) NPTEL:https://nptel.ac.in/courses/106/105/106105174/
2) https://www.saedsayad.com/data_mining.htm

DESIGN AND ANALYSIS OF ALGORITHMS
I M.C.A- II SEMESTER

Course Title: **DESIGN AND ANALYSIS OF ALGORITHMS**	Course Code: **24F00PC11**
Teaching Scheme (L:T:P): 3:0:0	Credits: 3
Type of Course: Lecture	
Continuous Internal Evaluation: 30 Marks	Semester End Exam: 70 Marks
Pre requisites:	

COURSE OVERVIEW: Design and Analysis of Algorithms is a fundamental aspect of computer science that involves creating efficient solutions to computational problems and evaluating their performance.
DSA focuses on designing algorithms that effectively address specific challenges and analyzing their efficiency in terms of **time** and **space complexity**

COURSE OBJECTIVES:

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

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

COURSE OUTCOMES:

CO#	Course Outcomes
CO1	Describe asymptotic notation used for denoting performance of algorithms.
CO2	Analyze the performance of a given algorithm and denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms.
CO3	List and describe various algorithmic approaches.
CO4	Solve problems using divide and conquer, greedy, dynamic programming, backtracking and branch and bound algorithmic approaches.
CO5	Apply graph search algorithm store al world problems.

COURSE CONTENT (SYLLABUS)

UNIT-I: **10 Hours**

Introduction: Algorithm, Pseudo code for expressing algorithms, performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, probabilistic analysis, Amortized analysis. Disjoint Sets-disjoint set operations, union and find algorithms, spanning trees, connected components and bi- connected components. COs-C01

UNIT-II: **15 Hours**

Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Stassen's matrix multiplication, Convex shell. Greedy method: General method, applications-Job sequencing with deadlines, 0/1 knapsack problem, Minimum cost spanning trees, Single source shortest path problem. COs-C02

UNIT-III: **15 Hours**

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, Reliability design.. COs-C03

UNIT-IV: **10 Hours**

Backtracking: General method, applications-n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles. COs-C04

UNIT V: **10 Hours**

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 -Hardand NP-Complete problems: Basic concepts, non deterministic algorithms, NP - Hard and NP Complete classes, Cook's theorem. COs-C05

Text Books:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahniand Rajase kharam, Universities Press
2. The Algorithm Design Manual, 2ndedition, 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
2) Design and Analysis of Algorithms, Pearson Education, Parag Himanshu Dave, Himansu Balachandra Dave
3) Introduction to Design and Analysis of Algorithms A strategic approach, R.C.T .Lee, S.S.Tseng, R.C.Chang and T.Tsai, Mc Graw Hill.
4) Design and Analysis of algorithms, Pearson education, Aho, Ullman and Hopcroft

Web References:

1) https://www.Design and Analysis of Algorithms - GeeksforGeeks
2) https://www. DAA Tutorial | Design and Analysis of Algorithms Tutorial - javatpoint

Database Management System Lab

I M.C.A- II SEMESTER

Course Title: **Database Management System Lab**	Course Code: **24F00PC12**
Teaching Scheme (L:T:P): 0:0:3	Credits: 1.5
Type of Course: Practicals	
Continuous Internal Evaluation: 30 Marks	Semester End Exam: 70 Marks
Pre requisites:	

Course overview:

A database is an organized collection of data stored in a computer system and usually controlled by a database management system (DBMS).

The data in common databases is modeled in tables, making querying and processing efficient. Structured query language (SQL) is commonly used for data querying and writing.

COURSE OBJECTIVES:

1. This Course will enable students to
2. Populate and query a database using SQL DDL/DML Commands
3. Declare and enforce integrity constraints on a database
4. Writing Queries using advanced concepts of SQL
5. Programming PL/SQL including procedures, functions, cursors and triggers.

CO#	Course Outcomes
CO1	Utilize SQL to execute queries for creating database and performing data manipulation operations
CO2	Examine integrity constraints to build efficient databases
CO3	Apply Queries using Advanced Concepts of SQL

List of Experiments:

1. Execute all DDL, DML and DCL commands on sample tables.
2. Implementation of different types of operators and built-in functions with suitable examples
3. Implementation of different types of joins with suitable examples
4. Create views, partitions, Sequence, Indexes and locks for a particular DB
5. Implement different types of constraints on relations.
6. Implementation of sub queries and nested queries.
7. Implement Queries on Group By & Having Clauses, ALIAS, Sequence By, Order By
8. Control Structure
    a. Write a PL/SQL block for Addition of Two Numbers
    b. Write a PL/SQL block for IF, IF and else condition
    c. Write a PL/SQL block for implementation of loops
    d. Write a PL/SQL block for greatest of three numbers using IF and ELSEIF
9. Exception Handling- Implement the following with respect to exception handling. Raising Exceptions, User Defined Exceptions, Pre-Defined Exceptions.

10. Write PL/SQL block for an application using exception handling Procedures
    a. Write a PL/SQL Procedure using Positional Parameters
    b. Write a PL/SQL Procedure using notational parameters
    c. Write a PL/SQL Procedures for cursor implementation (explicit and implicit cursors)
11. **Functions:**
    a. Write a PL/SQL block to implement factorial using functions
    b. Develop a PL/SQL function get_bonus that takes an employee ID and returns a bonus amount based on the employee's salary: 10% for salaries above $50,000, otherwise 5%. Test the function with various salaries.
12. Write a DBMS program to prepare Pl/SQL reports for an application using functions.
13. **Triggers:**
    a. Write a Trigger to pop-up the DML operations
    b. Write a Trigger to check the age valid or not Using Message Alert.
    c. Create a Trigger to Raise appropriate error code and error message.
    d. Create a Trigger on a table so that it will update another table while inserting values
14. Write PL/SQL block for an application using cursors and all types of triggers.
15. Write a PL/SQL block for transaction operations of a typical application using package

Text Books:

1) Oracle: The Complete Reference by oracle Press.
2) Nilesh Shah, " Database Systems using Oracle ", PHI, 2007
3) Rick F Vander Lans, "Introduction to SQL ", Fourth Edition , Pearson Education, 2007

Computer Networks Lab
I M.C.A- II SEMESTER

Course Title: **Computer Networks Lab**	Course Code: **24F00PC13**
Teaching Scheme (L:T:P): 0:0:3	Credits: 1.5
Type of Course: Practicals	
Continuous Internal Evaluation: 30 Marks	Semester End Exam: 70 Marks
Pre requisites:	

Course overview:

In computer networking, instead of phones, we have computers and instead of phone lines, we use cables, Wi-Fi, or other methods to connect them.

When computers are connected to a network, they can share information and resources, like files, printers, and internet connections.

This allows them to communicate with each other quickly and easily, just like friends talking on their phones.

Course Objectives:

These objectives aim to equip students with practical skills in implementing and understanding network protocols, IPC mechanisms, and client-server communications.

CO#	Course Outcomes
CO1	Demonstrate the ability to implement and analyze various network protocols.
CO2	Apply and evaluate key algorithms such as Dijkstra's for shortest path calculation and distance vector routing algorithms
CO3	Implement and utilize different IPC mechanisms, including pipes, FIFOs, message queues, and shared memory, to facilitate effective communication and synchronization between processes in a multi-tasking environment.
CO4	Design, develop, and test TCP and UDP client-server applications
CO5	Apply error detection techniques

LIST OF EXPERIMENTS

PART – A

1. Implement the data link layer farming methods such as character stuffing and bit stuffing.
2. Implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.
3. Implement Dijkstra's algorithm to compute the Shortest path through a graph.
4. Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table art each node using distance vector routing algorithm
5. Take an example subnet of hosts. Obtain broadcast tree for it.

PART – B

1. Implement the following forms of IPC.
   a) Pipes b) FIFO
2. Implement file transfer using Message Queue form of IPC
3. Write a programme to create an integer variable using shared memory concept and increment the variable
4. Simultaneously by two processes. Use semaphores to avoid race conditions
5. Design TCP iterative Client and server application to reverse the given input sentence
6. Design TCP client and server application to transfer file
7. Design a TCP concurrent server to convert a given text into upper case using multiplexing system call "select"
8. Design a TCP concurrent server to echo given set of sentences using poll functions
9. Design UDP Client and server application to reverse the given input sentence
10. Design UDP Client server to transfer a file
11. Design using poll client server application to multiplex TCP and UDP requests for converting a given text into upper case.

Software Engineering and Design Patterns Lab

I M.C.A- II SEMESTER

Course Title: **Software Engineering and Design Patterns Lab**	Course Code: **24F00PC14**
Teaching Scheme (L:T:P): 0:0:3	Credits: 1.5
Type of Course: Practicals	
Continuous Internal Evaluation: 30 Marks	Semester End Exam: 70 Marks
Pre requisites:	

Course Overview: This overview provides a foundational understanding of what a Software Engineering and Design Patterns course typically includes, preparing students for real-world software development challenges.

COURSE OBJECTIVES:

1. To develop problem-solving skills by defining real-world problems and creating detailed documentation including flowcharts, SRS sheets, and risk management plans.
2. To apply effort estimation techniques such as COCOMO and Function Points (FP) to assess project effort and manage project timelines using PERT or CPM.
3. To design and model software systems using various software engineering tools and techniques, including E-R diagrams, DFDs, CF diagrams, and structured charts.
4. To design effective test cases and perform thorough testing based on requirements and design specifications.
5. To understand and apply version control and change control practices for managing software configuration items.

By the end of this lab course, students should be able to:

CO#	Course Outcomes
CO1	Clearly articulate problem statements for real-world systems and develop flowcharts to illustrate problem-solving approaches and Create a comprehensive Software Requirements Specification (SRS) document for the chosen system.
CO2	Use the COCOMO model to estimate the effort required for a software project and Perform Function Point (FP) estimation to assess the project's complexity and required effort and Develop a project timeline and scheduling plan using PERT or CPM methods
CO3	Identify and analyze potential risks associated with a project and prepare a Risk Management, Monitoring, and Mitigation (RMMM) plan and Draw and interpret E-R diagrams, Data Flow Diagrams (DFD), Control Flow Diagrams (CFD), and structured charts to model the system's architecture and data flow.
CO4	Create test cases based on system requirements and design to ensure the software meets the specified criteria and Prepare version control and change control documentation to effectively manage software configuration items throughout the development lifecycle.
CO5	Design and implement the Abstract Factory, Builder, Façade, Bridge, and Decorator design patterns using UML diagrams and Java code and Demonstrate the practical application of these patterns to solve design problems and Design and implement the Chain of Responsibility pattern to manage request handling in a system, such as processing print commands in a word processing application.

List of Experiments

1. Write down the problem statement for a suggested system of relevance. Develop Flow-Charts to understand basic problem solving technique
2. Do requirement analysis and develop Software Requirement Specification Sheet (SRS) for suggested system.
3. Using COCOMO model estimate effort.
4. Perform Estimation of effort using FP Estimation for chosen system
5. Analyze the Risk related to the project and prepare RMMM plan.
6. Develop Time-line chart and project table using PERT or CPM project scheduling methods.
7. Draw E-R diagrams, DFD, CFD and structured charts for the project.
8. Design of Test cases based on requirements and design.
9. Prepare FTR
10. Prepare Version control and change control for software configuration items.
11. Using UML/JAVA, design Abstract Factory design pattern
12. Using UML/JAVA, design Builder design pattern
13. Using UML/JAVA, design Façade design pattern
14. Using UML/JAVA, design Bridge design pattern
15. Using UML/JAVA, design Decorator design pattern
16. User gives a print command from a word document. Design to represent this chain of responsibility design pattern

Exercise Problems

1. Using UML/JAVA, design Factory Method design pattern.
2. Using UML/JAVA, design Prototype
3. Using UML/JAVA, design Singleton
4. Using UML/JAVA , design Adapter design pattern
5. Using UML/JAVA , design Composite design pattern
6. Using UML/JAVA, design Flyweight, Proxy design pattern

EMPLOYABILITY SKILLS
I M.C.A- II SEMESTER

Course Title: **EMPLOYABILITY SKILLS**	Course Code: **R24MCA2109**
Teaching Scheme (L:T:P): 0:0:1	Credits: 0.5
Type of Course: Practicals	
Continuous Internal Evaluation: 0 Marks	Semester End Exam: 25 Marks
Pre requisites:	

Course Overview: Employability skills refer to the latter—they are workplace or transferable skills that help make you an impactful employee.

You can also think of them as skills that employers tend to value.

Many employability skills are "higher cognitive skills" that can't be carried out in automated tasks because they require creativity, critical thinking, and other important social and emotional abilities.

COURSE OBJECTIVES:

The main of this course is

- To learn how to make effective presentations and impressive interviews
- To learn skills for discussing and resolving problems on the work site
- To assess and improve personal grooming.
- To promote safety awareness including rules and procedures on the work site
- To develop and practice self management skills for the work site

By the end of this lab course, students should be able to:

CO#	Course Outcomes
CO1	By the end of this course, the student
CO2	• Recite the soft skills
CO3	• Make presentations effectively with appropriate ody language
CO4	• Be composed with positive attitude
CO5	• Apply their core competencies to succeed in professional and personal life

List of Experiments:

A list of vital employability skills from the stand point of engineering students with discussion how to potentially develop such skills through campus life.

1) Soft Skills: An Introduction–Definition and Significance of Soft Skills; Process, Importance and Measurement of Soft Skill Development.
2) Self-Discovery: Discovering the Self; Setting Goals; Beliefs, Values, Attitude, Virtue.
3) Positivity and Motivation: Developing Positive Thinking and Attitude; Driving out Negativity; Meaning and Theories of Motivation; Enhancing Motivation Levels.
4) Time Management–Concept, Essentials, Tips.
5) Personality Development– Meaning, Nature, Features, Stages, Models; Learning Skills; Adaptability Skills.
6) Decision-Making and Problem-Solving Skills: Meaning, Types and Models, Group and Ethical Decision-Making, Problems and Dilemmas in application of these skills.
7) Conflict Management: Conflict- Definition, Nature, Types and Causes; Methods of Conflict Resoultion.
8) Stress Management: Stress - Definition, Nature, Types, Symptoms and Causes; Stress Analysis Models and Impact of Stress; Measurement and Management of Stress

9) Leadership and Assertiveness Skills: A Good Leader; Leaders and Managers; Leadership Theories; Types of Leaders; Leadership Behaviour ; Assertivness Skills.

Note: The student shall be instructed to Record a 2 min video and add to profile before and after taking the course. Students are to be involved in Role Play, Team dynamics, Group Discussion and out comes are to be recorded.

Reference Books:

1) B. arun, K.Mitra, Personality Development and SoftSkills,Oxford University Press,2011.
2) S.P.Dhanavel,English and SoftSkills,OrientBlackswan,2010.
3) R.S.Aggarwal, A Modern Approach to Verbal& Non-Verbal Reasoning, S.Chand& Company Ltd., 2018.
4) Raman, Meenakshi & Sharma ,Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.
5) Managing Soft Skills for Personality Development – edited by B.N.Ghosh, Mc Graw Hill India, 2012.
6) English and Soft Skills–S.P.Dhanavel, Orient Blackswan India,2 010.

MACHINE LEARNING WITH PYTHON

II M.C.A-III SEMESTER

Course Title : **MACHINE LEARNING WITH PYTHON**	Course Code: **24F00PC14**
Teaching Scheme(L:T:P): 3:0:0	Credits:3
Type of Course: Lecture +Tutorial	
Continuous Internal Evaluation: 30Marks	Semester End Exam: 70 Marks
Pre requisites:	

Course Overview:

Course Objectives:

From the course the student will learn

- To design and analyze various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
- Explore supervised and unsupervised learning paradigms of machine learning.
- To explore Deep learning technique and various feature extraction strategies.

CO#	Course Outcomes
CO1	Illustrate and comprehend the basics of Machine Learning with Python
CO2	Demonstrate the algorithms of Supervised Learning and be able to differentiate linear and logistic regressions.
CO3	Demonstrate the algorithms of Unsupervised Learning and be able to understand the clustering algorithms
CO4	Evaluate the concepts of binning, pipeline Interfaces with examples.
CO5	Apply the sentiment analysis for various case studies.

COURSECONTENT(SYLLABUS)

UNIT I: **13 Hours**

Introduction to Machine Learning with Python: Introduction to Machine Learning, basic terminology, Types of Machine Learning and Applications, Using Python for Machine Learning: Installing Python and packages from the Python Package Index, Introduction to NumPy, SciPy, matplotlib and scikit-learn, Tiny application of Machine Learning. **COs-C01**

UNIT II: **12 Hours**

Supervised Learning: Types of Supervised Learning, Supervised Machine Learning Algorithms: kNearest Neighbors, Regression Models, Naive Bayes Classifiers, Decision Trees, Ensembles of Decision Trees, Kernelized Support Vector Machines, Uncertainty Estimates from Classifiers. **COs-C02**

UNIT III: **10 Hours**

Building good training datasets: Dealing with missing data, Handling categorical data, partitioning a data set into separate training and test datasets, bringing features onto the same scale, selecting meaningful features, assessing feature importance with random forests.

Compressing data via dimensionality reduction: Unsupervised dimensionality reduction via PCA, Supervised data compression via linear discriminant analysis (Text Book 2) **COs-CO3**

UNIT IV: **12 Hours**

Learning best Practices for Model Evaluation and Hyperparameter tuning: streamlining workflows with pipelines, using k-fold cross validation to assess model performance, debugging algorithms with learning and validation curves, fine tuning machine learning models via grid search, looking at different performance evaluation metrics. **Combining different models for Ensemble learning**: learning with ensembles, combining classifiers via majority vote, bagging-building an ensemble of classifiers from bootstrap samples, leveraging weak learners via adaptive boosting (Text Book 2) **COs-C04**

UNIT V: **10 Hours**

Working with Text Data (Data Visualization): Types of Data Represented as Strings, Example Application: Sentiment Analysis of Movie Reviews, Representing Text Data as a Bag of Words, Stop Words, Rescaling the Data with tf-idf, Investigating Model Coefficients, Approaching a Machine Learning Problem, Testing Production Systems, Ranking, Recommender Systems and Other kinds of Learning.

COs-C05

Text Books:

1) Introduction to Machine Learning with Python: A Guide for Data Scientists, Andreas C. Muller & Sarah Guido, Orielly Publications, 2019.
2) Python Machine Learning, Sebastian Raschka & Vahid Mirjalili, 3rd Edition, 2019.
3) Machine Learning using Python, Manaranjan Pradhan, U Dinesh Kumar, Wiley, 1st Edition, 2019

Reference Books:

1) Machine Learning, Tom M. Mitchell, Mc Graw-Hill Publication, 2017
2) Building Machine Learning Systems with Python, Luis Pedro Coelho, Willi Richert, 2nd Edition, 2015.
3) Programming and Problem Solving with Python, Ashok Namdev Kamthane, Amit Ashok Kamthane, TMH, 2019.

INTERNET OF THINGS

II M.C.A-III SEMESTER

Course Title: **INTERNET OF THINGS**	Course Code: **24F00PC15**
Teaching Scheme(L:T:P): 3:0:0	Credits: 3
Type of Course: Lecture +Tutorial	
Continuous Internal Evaluation: 30Marks	Semester End Exam: 70 Marks
Pre requisites:	

Course Objectives:

Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.

• Formalize a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc).

• Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports.

CO#	Course Outcomes
CO1	At the end of the course, student will be able to Explain the definition and usage of the term 'the internet of things' in different contexts
CO2	Discover the various network protocols used in IoT
CO3	Define the role of big data, cloud computing and data analytics in a typical IoT system
CO4	Compare and contrast the threat environment based on industry and/or device type
CO5	Design a simple IoT system made up of sensors, wireless network connection, data analytics and display/actuators, and write the necessary control software

COURSE CONTENT(SYLLABUS)

UNIT- I: **10 Hours**

The Internet of Things: An Overview of Internet of things, Internet of Things Technology, behind Io Ts Sources of the Io Ts, M2M Communication, Examples of IoTs, Design Principles For Connected Devices Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet. **COs-CO1**

UNIT-II: **15 Hours**

Business Models for Business Processes in the Internet of Things ,IoT/M2M systems LAYERS AND designs standardizations ,Modified OSI Stack for the IoT/M2M Systems ,ETSI M2M domains and High-

level capabilities ,Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability **COs-CO2**

UNIT-III: **10 Hours**

Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices **COs-CO3**

UNIT-IV: **10 Hours**

Data Acquiring, Organizing and Analytics in IoT/M2M, Applications /Services /Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

UNIT-V: **15 Hours**

Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology ,Sensing the World. **COs-CO5**

Text Books:

1) Internet of Things: Architecture, Design Principles And Applications, 1st ed, Rajkamal, McGraw Hill Higher Education, 2017.
2) Internet of Things, 1st ed, A.Bahgya and V.Madisetti, Univesity Press, 2014

Reference Books:

1) Designing the Internet of Things, 1st ed, Adrian McEwen and Hakim Cassimally, Wiley, 2013.
2) Getting Started with the Internet of Things, 1st ed, CunoPfister , Oreilly, 2011.

WEB TECHNOLOGIES

II M.C.A-III SEMESTER

Course Title: **WEB TECHNOLOGIES**	Course Code: **24F00PC16**
Teaching Scheme(L:T:P): 3:0:0	Credits: 3
Type of Course: Lecture +Tutorial	
Continuous Internal Evaluation: 30Marks	Semester End Exam: 70 Marks
Pre requisites:	

COURSE OVERVIEW: Object-oriented programming aims to *implement real-world entities* like inheritance, hiding, polymorphism etc. in programming.
OOP stands for Object-Oriented Programming.
Procedural programming is about writing procedures or methods that perform operations on the data.

COURSE OBJECTIVES:

To Learn PHP language for server side scripting
• To introduce XML and processing of XML Data with Java
• To introduce Server side programming with Java Servlets and JSP
• To introduce Client side scripting with JavaScript.

COURSE OUTCOMES:

At the end of the course, student will be able

CO#	Course Outcomes
CO1	Analyze a web page and identify its elements and attributes.
CO2	To acquire knowledge of xml fundamentals and usage of xml technology in electronic data interchange
CO3	Build dynamic web pages using JavaScript (client side programming).To design and develop web based enterprise systems for the enterprises using technologies like jsp, servlet
CO4	To design and develop web based enterprise systems for the enterprises using technologies like jsp, servlet Build web applications using PHP
CO5	Build web applications using PHP.

COURSE CONTENT(SYLLABUS)

UNIT-I: **15 Hours**

Web Basics- Introduction, Concept of Internet- History of Internet, Protocols of Internet, World Wide Web, URL, Web Server, Web Browser. **HTML- Introduction**: History of HTML, Structure of HTML Document: Text Basics, Structure of HTML Document: Images and Multimedia, Links and webs, Document Layout, Creating Forms, Frames and Tables, Cascading style sheets. **COs-C01**

UNIT-II: **12 Hours**

XML Introduction- Introduction of XML, , Defining XML tags, their attributes and values, Document Type Definition, XML Schemes, Document Object Model, XHTML Parsing XML Data – DOM and SAX Parsers in java. **COs-CO2**

UNIT-III: **13 Hours**

Introduction to Servlets: Common Gateway Interface (CGI), Life cycle of a Servlet, deploying a Servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions, connecting to a database using JDBC. **COs-C03**

UNIT-IV: **14 Hours**

Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking, connecting to database in JSP. Client-side Scripting: Introduction to JavaScript, JavaScript language – declaring variables, scope of variables, functions. event handlers (onClick, onSubmit etc.), Document Object Model, Form validation.. **COs-C04**

UNIT-V: **15 Hours**

Introduction to PHP: Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, reading data from web form controls like text boxes, radio buttons, lists etc., Handling File Uploads. Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories. **COs-C05**

Text Books:

1) Web Technologies, Uttam K Roy, Oxford University Press.
2) The Complete Reference PHP — Steven Holzner, Tata McGraw-Hill.

Reference Books:

1) Web Programming, building internet applications, Chris Bates 2nd edition, Wiley Dreamtech.

2) Java Server Pages —Hans Bergsten, SPD O'Reilly.

3) Java Script, D.Flanagan 4) Beginning Web Programming-Jon Duckett WROX.

CRYPTOGRAPHY AND NETWORK SECURITY

II M.C.A-III SEMESTER

Course Title: **CRYPTOGRAPHY AND NETWORK SECURITY**	Course Code: **24F00PC17**
Teaching Scheme(L:T:P): 3:0:0	Credits: 3
Type of Course: Lecture +Tutorial	
Continuous Internal Evaluation: 30Marks	Semester End Exam: 70 Marks
Pre requisites:	

Course Overview:

- Introduction to Linux. Introduction to Linux Operating System. Linux Full Form. whaare
- Getting Started with Linux. How to install and Run Linux Software in Windows 10 using …
- Basic Linux Commands: Is cp touch. man. cal. pwd mv lngrepwcmkdirrm cat. echo df cd …
- Linux File System. Linux File Hierarchy Structure. Linux Directory Structure.

Course Objectives:

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

CO#	Course Outcomes
CO1	At the end of the course, student will be able to • Explain Basic Principles, different security threats, countermeasures, foundation course of cryptography mathematics and Symmetric Encryption.
CO2	Classify the basic principles of Asymmetric key algorithms and operations of asymmetric key cryptography.
CO3	Design Cryptographic Hash Functions as SHA-3 and Digital Signatures as Elgamal
CO4	Explain the concept of Revise Key Management and Distribution and User Authentication
CO5	Determine the knowledge of Network and Internet Security Protocols such as S/MIME

COURSE CONTENT(SYLLABUS)

UNIT-I: **14 Hours**

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.
COs-CO1

UNIT-II: **12 Hours**

Asymmetric Encryption: Mathematics of Asymmetric Key Cryptography-Primes, primality Testing, Factorization, Asymmetric Key Cryptography-RSA Cryptosystem, Rabin Cryptosystem, ElGamal Cryptosystem, Elliptic Curve Cryptosystem **COs-CO2**

UNIT-III: **13 Hours**

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 **COs-CO3**

UNIT-IV: **17 Hours**

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. **COs-C04**

UNIT-V: **Network and Internet Security** **12Hours**

Electronic Mail Security: Internet Mail Architecture, Email Formats, Email Threats and Comprehensive Email Security, S/MIME. **IP Security**: IP Security Policy, Encapsulating Security Payload, Combining Security Associations Internet Key Exchange **COs-C05**

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

SOFT COMPUTING

II M.C.A-III SEMESTER

Course Title :**SOFT COMPUTING**	Course Code: **24F00PE02.1**
Teaching Scheme(L:T:P): 3:0:0	Credits: 3
Type of Course: Lecture +Tutorial	
Continuous Internal Evaluation: 30 Marks	Semester End Exam: 70 Marks
Pre requisites:	

Course Objectives:

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

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CO#	Course Outcomes
CO1	Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.
CO2	Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic
CO3	To understand the fundamental theory and concepts of neural networks, Identify different neural network architectures, algorithms, applications and their limitations
CO4	Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications
CO5	Reveal different applications of these models to solve engineering and other problems

COURSE CONTENT(SYLLABUS)

UNIT-I: **17 Hours**

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 Modeling. **COs-C01**

UNIT-II: **13 Hours**

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. . **COs-C02**

UNIT-III: **15 Hours**

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 **COs-C03**

UNIT-IV: **12 Hours**

Neuro Fuzzy Modeling: Adaptive Neuro-Fuzzy Inference Systems, Architecture Hybrid Learning Algorithm, Learning Methods that Cross-fertilize ANFIS and RBFN Coactive Neuro Fuzzy Modeling, Framework Neuron Functions for Adaptive Networks Neuro Fuzzy Spectrum **COs-C04**

UNIT-V: **10 Hours**

Applications Of Computational Intelligence: Printed Character Recognition, Inverse Kinematics Problems, Automobile Fuel Efficiency Prediction, Soft Computing for Coloripe Prediction. **COs-C05**

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

Reference Books:

1) Artificial Intelligence, Second Edition, Elaine Rich & Kevin Knight, Tata McGraw Hill Publishing Comp., New Delhi, , 2nd edition-2006
2) "Fuzzy Logic with Engineering Applications", Timothy J.Ross, McGraw-Hill, 3 rd edition-1997.

Web References:

1 https://www.codecademy.com/courses/learn-java/lessons/hello-world-java/exercises/introduction-to-java

2 https://www.w3schools.com/java/java_variables.asp

https://www.geeksforgeeks.org/java/

SOFTWARE PROJECT MANAGEMENT
II M.C.A-III SEMESTER

Course Title : **SOFTWARE PROJECT MANAGEMENT**	Course Code: **24F00PE02.2**
Teaching Scheme(L:T:P): 3:0:0	Credits: 3
Type of Course: Lecture +Tutorial:	
Continuous Internal Evaluation: 30 Marks	Semester End Exam: 70 Marks
Pre requisites:	

COURSE OBJECTIVES:

To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project

• To compare and differentiate organization structures and project structures

• To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

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

CO#	Course Outcomes
CO1	Apply the process to be followed in the software development life-cycle models
CO2	Apply the concepts of project management & planning
CO3	Implement the project plans through managing people, communications and change
CO4	Conduct activities necessary to successfully complete and close the Software projects
CO5	Implement communication, modeling, and construction & deployment practices in software development

COURSE CONTENT(SYLLABUS)

UNIT-I: **15 Hours**

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.
The old way and the new: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process **COs-C01**

UNIT-II: **10 Hours**

Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases.
Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts. . **COs-C02**

UNIT-III: **15 Hours**

Model based software architectures: A Management perspective and technical perspective.
Work Flows of the process: Software process workflows, Iteration workflows
Checkpoints of the process: Major mile stones, Minor Milestones, Periodic status assessments.
Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning. **COs-C03**

UNIT-IV: **15 Hours**

Project Organizations and Responsibilities:
Line-of-Business Organizations, Project Organizations, evolution of Organizations.
Process Automation: Automation Building blocks, The Project Environment.
Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation. **COs-C04**

UNIT-V: **14 Hours**

Agile Methodology, adapting to Scrum, Patterns for Adopting Scrum, Iterating towards Agility.
Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system. DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes **COs-C05**

Text Books:

1) Software Project Management, Walker Royce, PEA, 2005.
2) Succeeding with Agile: Software Development Using Scrum, Mike Cohn, Addison Wesley.
3) The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim , John Willis , Patrick Debois , Jez Humb,1st Edition, O'Reilly publications, 2016

Reference Books:

1) Software Project Management, Bob Hughes,3/e, Mike Cotterell, TMH
2) Software Project Management, Joel Henry, PEA
3) Software Project Management in practice, PankajJalote, PEA, 2005,
4) Effective Software Project Management, Robert K.Wysocki, Wiley,2006
5) Project Management in IT, Kathy Schwalbe, Cengage
6) Quality Software Project Management, Futrell,Donald F. Shafer, Donald I. Shafer, PEA

Web References:

1 https://www.codecademy.com/courses/learn-java/lessons/hello-world-java/exercises/introduction-to-java
2 https://www.w3schools.com/java/java_variables.asp
https://www.geeksforgeeks.org/java/

CLOUD COMPUTING

II M.C.A-IIISEMESTER

Course Title :**CLOUD COMPUTING**	Course Code: **24F00PE02.3**
Teaching Scheme(L:T:P): 3:0:0	Credits: 3
Type of Course: Lecture +Tutorial	
Continuous Internal Evaluation: 30 Marks	Semester End Exam: 70 Marks
Pre requisites:	

COURSE OBJECTIVES:

1) The main objective of the course is to implement Virtualization, Task Scheduling algorithms, apply Map-Reduce concept to applications, building Private Cloud and to know the impact of engineering on legal and societal issues involved.

CO#	Course Outcomes
CO1	Interpret the key dimensions of the challenge of Cloud Computing
CO2	Examine the economics, financial, and technological implications for selecting cloud computing for own organization
CO3	Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications
CO4	Evaluate own organizations' needs for capacity building and training in cloud computing-related IT areas
CO5	Illustrate Virtualization for Data-Center Automation

COURSE CONTENT(SYLLABUS)

UNIT- I: Introduction: **15 Hours**

Systems modeling, Clustering and virtualization:

Scalable Computing over the Internet, Technologies for Network based systems, System models for Distributed and Cloud Computing, Software environments for distributed systems and clouds, Performance, Security And Energy Efficiency **COs-CO1**

UNIT- II: **12 Hours**

Virtual Machines and Virtualization of Clusters and Data Centers:

Implementation Levels of Virtualization, Virtualization Structures/ Tools and mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data Centre Automation **COs-CO2**

UNIT-III **12 Hours**

Cloud Platform Architecture:

Cloud Computing and service Models, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, Inter Cloud Resource Management, Cloud Security and Trust Management. Service Oriented Architecture, Message Oriented Middleware. **COs-CO3**

UNIT-IV: **12 Hours**

Cloud Programming and Software Environments:

Features of Cloud and Grid Platforms, Parallel & Distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments. Storage Systems: Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system, Apache Hadoop, BigTable, Megastore, Amazon Simple Storage Service(S3). **COs-CO4**

UNIT-V: **16 Hours**

Cloud Resource Management and Scheduling :

Policies and Mechanisms for Resource Management Applications of Control Theory to Task Scheduling on a Cloud, Stability of a Two Level Resource Allocation Architecture, Feedback Control Based on Dynamic Thresholds. Coordination of Specialized Autonomic Performance Managers, Resource Bundling, Scheduling Algorithms for Computing Clouds, Fair Queuing, Start Time Fair Queuing, Borrowed Virtual Time, Cloud Scheduling Subject to Deadlines, Scheduling MapReduce Applications Subject to Deadlines.
COs-CO5

Board of Studies : Master of Computer Applications

Approved in BOS No: 21, August, 2024

Approved in ACM No: 21,August, 2024

Text Books:

1. Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier.
2. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.
3. Cloud Computing, A Hands on approach, ArshadeepBahga, Vijay Madisetti, University Press
4. Advanced Programming in the Unix environment by W. Richard Stevens

Reference Books:

1. Cloud Computing: A Practical Approach. Anthony T.Velte. Toby J.VeFte, Robert Elsenpeter. Tata McGraw Hill. rp2Oll.
2. Enterprise Cloud Computing GautamShroif, Cambridge University Press. 2010.
3. Cloud Computing: Implementation, Management and Security, John W. Rittinouse, James F Ransome. CRC Press, rp2012.
5. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud. George Reese, O'Really SPD, rp2Oll.
6. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, SubraKtriaraswamy, ShahedLatif, O'Redç SPD, rp2Oll.

Note: The students shall register in any of the Clouds like AWS/Azure, etc and learn about cloud services.

Web References:

1 https://www.geeksforgeeks.org/computer-organization-and-architecture-tutorials/?ref=lbp
2 https://www.jntufastupdates.com/jntuk-r20-2-1-operating-systems-material/

OPTIMIZATION TECHNIQUES

II M.C.A-III SEMESTER

Course Title :**OPTIMIZATION TECHNIQUES**	Course Code: **24F00PE02.4**
Teaching Scheme(L:T:P): 3:0:0	Credits: 3
Type of Course: Lecture +Tutorial	
Continuous Internal Evaluation: 30 Marks	Semester End Exam: 70 Marks
Pre requisites:	

Course Objectives:

1) To understand the theory of optimization methods and algorithms developed for solving various types of optimization problems.

2) To develop and promote research interest in applying optimization techniques in problems of Engineering and Technology.

3)To apply the mathematical results and numerical techniques of optimization theory to concrete Engineering problems.

.CO#	Course Outcomes
CO1	Describe clearly a problem, identify its parts and analyze the individual functions
CO2	Feasibility study for solving an optimization problem
CO3	Becoming a mathematical translation of the verbal formulation of an optimization problem
CO4	To design algorithms, the repetitive use of which will lead reliably to finding an approximate solution
CO5	Discovery, study and solve optimization problems
CO6	Investigate, study, develop, organize and promote innovative solutions for various applications

COURSE CONTENT(SYLLABUS)

UNIT-I: **15 Hours**

Development: Definition, Characteristics and Phrases, scientific method. Types of models, general methods for solving, operations research modes, **Allocation:** introduction linear programming formulation, graphical solution, simplex methods, artificial variable technique, duality principle. **COs-C01**

UNIT-II: **13 Hours**

Transportation problem: Formulation, optimal solution, unbalanced transportation**, Assignment problem**: formulation, optimal solution, variations problem, degeneracy i.e. non square MXN) matrix, restrictions, **Sequencing:** Introduction, optimal solution for processing each of n jobs through three machines, travelling salesman problem (i.e.) shortest acyclic route models. . **COs-C02**

UNIT-III: **12 Hours**

Replacement: Introduction, replacement of items that deteriorate when money value is not counted and counted, and replacement of items that fail completely (i.e.) group replacements, Waiting lines: Introduction, single channel, Poisson arrivals, exponential service time infinite population and unrestricted queu **COs-C03**

UNIT-IV: **15 Hours**

Inventory: Introduction, single item, deterministic models, production is instantaneous or at a constant rate , shortages are allowed or not allowed and with drawls from stock is continuous, purchase inventory model with one price break, shortages are not allowed, instantaneous production demand production or purchase cost is relevant, stochastic models, simple problems. **COs-C04**

UNIT-V: **15 Hours**

Theory of Games: Introduction, minmax (maximum), criterion and optimal strategy solution of games with saddle points, rectangular without saddle points. **Dynamic programming:** Introduction, Bellman's Principle of optimality, solutions for simple problems, **Project Management:** PERT and CPM, difference between PERT and CPM, PERT/CPM network components and precedence relations, Time Estimates for activities **COs-C05**

Text Books:

1) Operations Research, 2nd Edition, S.D.Sharma, Ramnath, &Kedarnath co, Meerut, 2009
2) Operations Research, An introduction, 8th Edition, Taha, Pearson, 2008

Reference Books:

1) Operations Research, Revised edition, P.K.Gupta, D.S. Hira, S.Chand, 2014
2) Operations Research, Problems & solutions, 2nd Edition, JK Sharma, Macmillan, 2003
3) Operations Research, 2nd Edition, Panneerselvam, PHI, 2004

Web References:

1 https://www.codecademy.com/courses/learn-java/lessons/hello-world-java/exercises/introduction-to-java

2 https://www.w3schools.com/java/java_variables.asp

https://www.geeksforgeeks.org/java/

CYBER SECURITY
II M.C.A- III SEMESTER

Course Title : **CYBER SECURITY**	Course Code: **24F00PE02.5**
Teaching Scheme (L:T:P): 3:0:0	Credits: 3
Type of Course: Lecture + Tutorial	
Continuous Internal Evaluation: 30 Marks	Semester End Exam: 70 Marks
Pre requisites:	

Course Overview :

In this course, you'll learn how to optimize your data analysis using data structures — and how to improve performance on common tasks like searching and sorting.

Course Objectives:

- To familiarize various types of cyber-attacks and cyber-crimes
- To give an overview of the cyber laws
- To study the defensive techniques against these attacks.

CO#	Course Outcomes
CO1	student will be able to understand cyber-attacks
CO2	Types of cybercrimes
CO3	cyber laws and also how to protect them self
CO4	and ultimately the entire Internet community from such attacks

COURSE CONTENT (SYLLABUS)

UNIT-I: Introduction to the 'C' Programming **14 Hours**

Introduction to Cyber Security:

Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare,

Self-Learning Topics: String Pattern Matching **COs-C01**

UNIT-II: **16 Hours**

Cyberspace and the Law & Cyber Forensics:

Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science,

The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing **COs-C02**

Self-Learning Topics: Binary Files and operations on Binary files

UNIT-III: **17 Hours**

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops **COs-C03**

UNIT-IV: **15 Hours**

Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations. **Cybercrime and Cyber terrorism:** Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals. **COs-C04**

UNIT-V: **13 Hours**

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc. **COs-C05**

Text Books:

1. Nina Godbole and SunitBelpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

Reference Books:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group

Web References:

1. http://www.hackerrank.com/domains/datastructures
2. http://www.github.com/topics/data_structures_c
3. http://nptel.ac.in/courses
4. http://www.cslibrary.stanford.edu

Machine Learning with Python Lab

II MCA-III SEMESTER

Course Title :**Machine Learning with Python Lab**	Course Code: 24F00PC18
Teaching Scheme(L:T:P): 0:0:3	Credits:1.5
Type of Course: Labaratory	
Continuous Internal Evaluation: 30 Marks	Semester End Exam: 70 Marks
Pre requisites:	

Course Objectives:

- Make use of Data sets in implementing the machine learning algorithms
- Implement the machine learning concepts and algorithms in any suitable language of choice.
- Design Python programs for various Learning algorithms.

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

- Implement procedures for the machine learning algorithms
- Design Python programs for various Learning algorithms
- Apply appropriate data sets to the Machine Learning algorithms
- Identify and apply Machine Learning algorithms to solve real world problems

Note: Consider any dataset from kaggle

Experiment 1:

Installation of Python and its packages (Pandas, NumPy, SciPy, matplotlib and scikit-learn)
(Install Anaconda, Jypyter Notebook, Programs covering basic concepts in Python Programming)
Basics of Python:
Write a program to read two numbers from user and display the result using bitwise & , | and ^ operators on the numbers.
Write a program to calculate the sum of numbers from 1 to 20 which are not divisible by 2, 3 or 5.
Write a program to find the maximum of two numbers using functions.
Implement slicing operation on strings and lists.

Experiment 2:

Implement python program to load structured data onto DataFrame and perform exploratory data analysis
Implement python program for data preparation activities such as filtering, grouping, ordering and joining of datasets.

Experiment 3:

Implement Python program to prepare plots such as bar plot, histogram, distribution plot, box

plot, scatter plot.

Experiment 4:

Implement Simple Linear regression algorithm in Python

Implement Gradient Descent algorithm for the above linear regression model

Experiment 5:

Implement Multiple linear regression algorithm using Python.

Experiment 6:

Implement Python Program to build logistic regression and decision tree models using the Python package stats model and sklearn APIs.

Experiment 7:

Implement Python Program to perform the activities such as

- splitting the data set into training and validation datasets

- building model using Python package on training dataset and test on the validation dataset

Experiment 8:

Write a Python program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions.

Experiment 9:

Implement Support vector Machine algorithm on any data set

Experiment 10:

Write a program to implement the naive Bayesian classifier for a sample training data set stored as a .csv file. Compute the accuracy of the classifier, considering few test data sets.

Experiment 11:

Write a Python program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.

Experiment 12:

Assuming a set of documents that need to be classified, use the naive Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision and recall for your data set.

Experiment 13:

Implement PCA on any Image dataset for dimensionality reduction and classification of images into different classes.

Experiment 14:

Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Internet of Things Lab
II MCA-III SEMESTER

Course Title :**Internet of Things Lab**	Course Code:PC24F00PC19
Teaching Scheme(L:T:P): 0:0:3	Credits:1.5
Type of Course: Labaratory	
Continuous Internal Evaluation: 30 Marks	Semester End Exam: 70 Marks
Pre requisites:	

Course Objectives:
Students will understand the concepts of Internet of Things and can able to build IoT applications.

Course Outcomes:
1. Interpret the impact and challenges posed by IoT networks leading to new architectural models.
2. Compare and contrast the deployment of smart objects and the technologies to connect them to network.
3. Appraise the role of IoT protocols for efficient network communication.
4. Elaborate the need for Data Analytics and Security in IoT.
5. Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

List of Experiments:
1) Familiarization with Arduino/Raspberry Pi and perform necessary software installation.
2) To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
3) To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
4) To interface DHT11 sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.
5) To interface motor using relay with Arduino/Raspberry Pi and write a program to turn ON motor when push button is pressed.
6) To interface OLED with Arduino/Raspberry Pi and write a program to print temperature and humidity readings on it.
7) To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth.
8) To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when ‘1’/’0’ is received from smartphone using Bluetooth.
9) Write a program on Arduino/Raspberry Pi to upload temperature and humidity data to thingspeak cloud.

10) Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from thingspeak cloud.
11) To install MySQL database on Raspberry Pi and perform basic SQL queries.
12) Write a program on Arduino/Raspberry Pi to publish temperature data to MQTT broker.
13) Write a program on Arduino/Raspberry Pi to subscribe to MQTT broker for temperature data and print it.
14) Write a program to create TCP server on Arduino/Raspberry Pi and respond with humidity data to TCP client when requested.
15) Write a program to create UDP server on Arduino/Raspberry Pi and respond with humidity data to UDP client when requested.

WEB TECHNOLOGIES LAB
I MCA-III SEMESTER

Course Title : WEB TECHNOLOGIES LAB	Course Code:PC24F00PC19
Teaching Scheme(L:T:P): 0:0:3	Credits:1.5
Type of Course: Labaratory	
Continuous Internal Evaluation: 30 Marks	Semester End Exam: 70 Marks
Pre requisites:	

Course Objectives:
• To implement the web pages using HTML and apply styles.
• Able to develop a dynamic webpage by the use of java script.
• Design to create structure of web page, to store the data in web document, and transport information through web.
• Able to write a well formed / valid XML document.

Course Outcomes (COs): At the end of the course, student will be able to
• Create dynamic and interactive web pages using HTML, CSS & Java Script
• Experiment with Learn and implement XML concepts
• Develop web applications using PHP
• Show the Install Tomcat Server and execute client-server programs
• Implement programs using Ruby programming

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 catalog
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: Write a PHP script to merge two arrays and sort them as numbers, in descending order. **Experiment 4:** Write a PHP script that reads data from one file and write into another file.

Experiment 5: Write a PHP script to print prime numbers between 1-50.

Experiment 6: Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.

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: Install TOMCAT web server. Convert the static web pages of assignments 2 into dynamic web pages using servlets and cookies. Hint: Users information (user id, password, credit card number) would be stored in web.xml. Each user should have a separate Shopping Cart.

Experiment 9: Redo the previous task using JSP by converting the static web pages of assignments 2 into dynamic web pages. Create a database with user information and books information. The books catalogue should be dynamically loaded from the database. Follow the MVC architecture while doing the website.

Experiment 10: Install a database(Mysql or Oracle). Create a table which should contain at least the following fields: name, password, email-id, phone number(these should hold the data from the registration form). Practice 'JDBC' connectivity. Write a java program/servlet/JSP to connect to that database and extract data from the tables and display them. Experiment with various SQL queries. Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page .

Experiment 11: Write a JSP which does the following job: Insert the details of the 3 or 4 users who register with the web site (week9) by using registration form. Authenticate the user when he submits the login form using the user name and password from the database.

Experiment 12: Create a simple visual bean with a area filled with a color. The shape of the area depends on the property shape. If it is set to true then the shape of the area is Square and it is Circle, if it is false. The color of the area should be changed dynamically for every mouse click.

R24MCA4101 DIGITAL MARKETING **3 0 0 3**

Course Objectives:

Digital marketing aims at being SMART (Specific, Measurable, Achievable, Relevant and Time Related) so that people can withstand against competitors.

Course Code	Course Outcomes	Mapping with POs and PSOs					Dok
		PO1	PO2	PO3	PS01	PS02	
R24MCA4101.1	Explain about web pages with basic HTML5, DHTML tags using CSS and XML, the overview of W3C DOM.	3	-	2	3	-	L1, L3
R24MCA4101.2	Discuss the key elements of a digital Java Scripts.	3	3	-	3	2	L3
R24MCA4101.3	Apply search engine optimization techniques to a website.	3	3	-	3	-	L1,L2,L3
R24MCA4101.4	Illustrate how the effectiveness of a digital marketing campaign can be measured.	3	-	3	3	-	L4, L5
R24MCA4101.5	Demonstrate advanced practical skills in common digital marketing tools such as SEO, SEM, Social media and Blogs	3	-	2	2	-	L3, L4

SYLLABUS

UNIT-I: Introduction to the 'HTML' Programming **15 Hours**

HTML: Introduction, HTML5, Audio Elements, Video Elements, Organizing Elements. Scripting **Documents:** Dynamic Document content, Document properties, Legacy DOM, Document Collections, Overview of the W3C DOM, Traversing a Document, Finding Elements in a Document, Modifying a Document, Adding Content to a Document **COs-C01**

Self-Learning Topics:

UNIT-II: **14 Hours**

Cascading Style Sheets and Dynamic HTML: Overview of CSS, CSS for DHTML Scripting inline Styles, Scripting computed styles, Scripting CSS Classes, Scripting Style Sheets, **Java Script and XML**: Obtaining XML Documents, Manipulating XML with the DOM API, Transforming XML with XSLT querying XML with X path, Serializing XML, Example, XML and Web services **COs-C02**

Self-Learning Topics:

UNIT-III: **15 Hours**

Search Engine Optimization (SEO): Searching Engine Marketing, Search Engine Optimization, Measuring SEO Success, Mapping with SEO Journey, **Search Advertising**: Online Advertising Payment Models, Search Advertising (Desktop & Mobile Devices), Planning & Executing a search Advertising Camping, Strategic Implications of Advertising on the search Network. **COs-C03**

UNIT-IV: **14 Hours**

Search Media Marketing: What is Social Media? Social Media Marketing, Social Media Marketing Strategy, Adopting Social Media in Organizations: Internal Learning, Paid-Owned-Earned Media, Social CRM,

Mobile Marketing: Mobile Internet in India, What is Mobile Marketing? Email Marketing Strategy, Forms of Mobile Marketing, Mobile Advertising, M-Commerce. **COs-C04**

UNIT-V: **11 Hours**

E-Mail Marketing: E-Mail Marketing in India, What is E-Mail Marketing? E-Mail Marketing Strategy, Executing E-Mail Marketing, **Internet Marketing**: Internet Marketing Strategy, Content Marketing, Content Marketing in India. **COs-C05**

Board of Studies : Master of Computer Applications
Approved in BOS No: 21, August, 2024
Approved in ACM No: 21, August, 2024

Text Books:

1. The Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted, and Measurable Online Campaigns, Ian Dodson, Wiley, 2016 Edition, Reema Thareja, Oxford
2. Programming the World Wide Web, Robet W Sebesta, Pearson, 8th edition, 2015

Reference Books:

1. Fundamentals of Digital Marketing, Second Edition, Pearson Paperback, 2019
2. Internet Marketing- A Practical approach in the India Context by Moutusy Maity, Oxford
3. Java Script: The Definite Guide David Flanagan, O' Reilly Publisher

Web References:

1. https://alison.com/course/advanced-
2. What Is Digital Marketing? Types and Examples - GeeksforGeeks
3. Online IT Course and Certification Company - Koenig Solutions
4. https://www.udemy.com/course/learn-digital

R24MCA4101 HUMAN RESOURCE MANAGEMENT 3 0 0 3

Course Objectives:

- Contribute to the development, implementation, and evaluation of employee recruitment, selection, and retention plans and processes.
- Administer and contribute to the design and evaluation of the performance management program.
- Develop, implement, and evaluate employee orientation, training, and development programs.
- Facilitate and support effective employee and labour relations in both non-union and union environments.

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

Course Code	Course Outcomes	Mapping with POs and PSOs					Dok
		PO1	PO2	PO3	PS01	PS02	
R24MCA4101.1	Explain the importance of human resources and their effective management in organizations	3	-	2	3	-	L1, L3
R24MCA4101.2	Demonstrate a basic understanding of different tools used in forecasting and planning, human resource need.	3	3	-	3	2	L3
R24MCA4101.3	Describe the meanings of terminology and tools used in managing employees effectively	3	3	-	3	-	L1,L2,L3
R24MCA4101.4	Make use of Record governmental regulations affecting employees and employers	3	-	3	3	-	L4, L5
R24MCA4101.5	Analyze the key issues related to administering the human elements such as motivation, compensation, appraisal, career planning, diversity, ethics, and training	3	-	2	2	-	L3, L4

SYLLABUS

UNIT-I: Introduction to the 'HTML' Programming **15 Hours**

HRM: Significance - Definition and Functions – evolution of HRM- Principles - Ethical Aspects of HRM- - HR policies, Strategies to increase firm performance - Role and position of HR department – aligning HR strategy with organizational strategy - HRM at global perspective -challenges – cross- cultural problems – emerging trends in HRM. **COs-C01**

Self-Learning Topics:

UNIT-II: **13 Hours**

Investment perspectives of HRM: HR Planning – Demand and Supply forecasting - Recruitment and Selection- Sources of recruitment - Tests and Interview Techniques - Training and Development – Methods and techniques – Training evaluation - retention - Job Analysis – job description and specifications - Management development - HRD concepts. **COs-C02**

Self-Learning Topics:

UNIT-III: **13 Hours**

Wage and Salary Administration: Concept- Wage Structure-Wage and Salary Policies- Legal Frame Work- Determinants of Payment of Wages- Wage Differentials - Job design and Evaluation- Incentive Payment Systems. Welfare management: Nature and concepts – statutory and non-statutory welfare measures – incentive mechanisms. **COs-C03**

UNIT-IV: **14 Hours**

Performance Evaluation: Importance – Methods– Traditional and Modern methods – Latest trends in performance appraisal - Career Development and Counseling- Compensation, Concepts and Principles- Influencing Factors- Current Trends in Compensation- Methods of Payments - compensation mechanisms at international level. . **COs-C04**

UNIT-V: **11 Hours**

Managing Industrial Relations: Trade Unions - Employee Participation Schemes- Collective Bargaining–Grievances and disputes resolution mechanisms – Safety at work – nature and importance– work hazards – safety mechanisms - Managing work place stress. **COs-C05**

Board of Studies : Master of Computer Applications
Approved in BOS No: 21, August, 2024
Approved in ACM No: 21, August, 2024

TextBooks:

1) K Aswathappa: "Human Resource and Personnel Management", Tata Mc

GrawHill, NewDelhi, 2013

2) N.Sambasiva Rao and Dr.Nirmal Kumar:“ Human Resource Management and Industrial Relations”, Himalaya Publishing House, Mumbai
3) Mathis, Jackson, Tripathy:“Human Resource Management:A south-Asin Perspective”, Cengage Learning, New Delhi, 2013
4) SubbaRaoP:“PersonnelandHumanResourceManagement-TextandCases”,HimalayaPublications, Mumbai, 2013.
5) Madhurima Lall,Sakina QasimZasidi:“Human Resource Management”, Excel Books, NewDelhi, 2010

Web References:

5. https://alison.com/course/advanced-
6. What Is Digital Marketing? Types and Examples - GeeksforGeeks
7. Online IT Course and Certification Company - Koenig Solutions
8. https://www.udemy.com/course/learn-digital

R24MCA4101 DEEP LEARNING **3 0 0 3**

Course Objectives:

1. Demonstrate the major technology trends driving Deep Learning
2. Build, train and apply fully connected deep neural networks
3. Implement efficient (vectorized) neural networks
4. Analyze the key parameters and hyper parameters in a neural network's architecture.

4.Facilitate and support effective employee and labour relations in both non-union and union environments.

Course Code	Course Outcomes	Mapping with POs and PSOs					Dok
		PO1	PO2	PO3	PS01	PS02	
R24MCA4101.1	Demonstrate the mathematical foundation of neural network	3	-	2	3	-	L1, L3
R24MCA4101.2	Describe the machine learning basics	3	3	-	3	2	L3
R24MCA4101.3	Compare the different architectures of deep neural network	3	3	-	3	-	L1,L2,L3
R24MCA4101.4	Build a convolutional neural network	3	-	3	3	-	L4, L5
R24MCA4101.5	Build and train RNN and LSTMs	3	-	2	2	-	L3, L4

SYLLABUS

UNIT-I: Introduction to the 'HTML' Programming **15 Hours**

Linear Algebra: Scalars, Vectors, Matrices and Tensors, Matrix operations, types of matrices, Norms, Eigen decomposition, Singular Value Decomposition, Principal Components Analysis. Probability and Information Theory: Random Variables, Probability Distributions, Marginal Probability, Conditional Probability, Expectation, Variance and Covariance, Bayes' Rule, Information Theory. Numerical Computation: Overflow and Underflow, Gradient-Based Optimization, Constrained Optimization, Linear Least Squares **COs-C01**

Self-Learning Topics:

UNIT-II: **14 Hours**

Machine Learning: Basics and Underfitting, Hyper parameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood, Bayesian Statistics, Supervised and Unsupervised Learning, Stochastic Gradient Descent, Challenges Motivating Deep Learning. Deep Feedforward Networks: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and

other Differentiation Algorithms. **COs-C02**

Self-Learning Topics:

UNIT-III: **16 Hours**

Regularization for Deep Learning: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop and Manifold Tangent Classifier. Optimiza tion for Training Deep Models: Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms. **COs-C03**

UNIT-IV: **11 Hours**

Convolutional Networks: The Convolution Operation, Pooling, Convolution, Basic Convolution Functions, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, Basis for Convolutional Networks. **COs-C04**

UNIT-V: **13 Hours**

Sequence Modeling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, Echo State Networks, LSTM, Gated RNNs, Optimization for Long-Term Dependencies, Auto encoders, Deep Generative Models. **COs-C05**

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Approved in ACM No: 21, August, 2024

Text Books:

3. Ian Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press,2016.
4. Josh Patterson and Adam Gibson, “Deep learning: A practitioner's approach”, O'Reilly Media, First Edition, 2017.

Reference Books:

4. Fundamentals of Deep Learning, Designing next-generation machine intelligence algorithms, Nikhil Buduma, O’Reilly, Shroff Publishers, 2019.
5. Deep learning Cook Book, Practical recipes to get started Quickly, Douwe Osinga, O’Reilly, Shroff Publishers, 2019.

Web References:

1) https://keras.io/datasets/

2) http://deeplearning.net/tutorial/deeplearning.pdf

3) https://arxiv.org/pdf/1404.7828v4.pdf

4) https://github.com/lisa-lab/DeepLearningTutorials

R24MCA4101 AD-HOC AND SENSOR NETWORKS **3 0 0 3**

Course Objectives:

5. From the course the student will learn
6. Architect sensor networks for various application setups
7. Devise appropriate data dissemination protocols and model links cost

4. Understanding of the fundamental concepts of wireless sensor networks and has a basic knowledge of the various protocols at various layers

5 Evaluate the performance of sensor networks and identify bottlenecks

Course Code	Course Outcomes	Mapping with POs and PSOs					Dok
		PO 1	PO2	PO3	PS01	PS02	
R24MCA4101.1	Evaluate the principles and characteristics of mobile adhoc networks(MANETs) and what distinguishes them from infrastructure-based networks	3	-	2	3	-	L1, L3
R24MCA4101.2	Determine the principles and characteristics of wireless sensor networks	3	3	-	3	2	L3
R24MCA4101.3	Discuss the challenges in designing MAC, routing and transport protocols for wireless ad-hoc sensor networks	3	3	-	3	-	L1,L2,L3
R24MCA4101.4	Illustrate the various sensor network Platforms, tools and applications	3	-	3	3	-	L4, L5
R24MCA4101.5	Demonstrate the issues and challenges in security provisioning and also familiar with the mechanisms for implementing security and trust mechanisms in MANETs and WSNs	3	-	2	2	-	L3, L4

SYLLABUS

UNIT-I: **14 Hours**

Introduction: Fundamentals of Wireless Communication Technology, The Electromagnetic Spectrum, Radio propagation Mechanisms ,Characteristics of the Wireless channel mobile ad hoc networks (MANETs), **Wireless Sensor Networks (WSNs):**concepts and architectures, Applications of Ad Hoc and Sensor Networks, Design Challengesin Ad hoc and Sensor Networks. **COs-CO1**

UNIT II: **14 Hours**

MAC Protocols For Ad Hoc Wireless Networks: Issues in designing a MAC Protocol, Issues in Designing a MAC Protocol for Ad Hoc Wireless Networks, Design Goals of a MAC Protocol for Ad Hoc Wireless Networks, Classification of MAC Protocols, Contention based protocols, Contention based protocols with Reservation Mechanisms, Contention based protocols with Scheduling Mechanisms, Multi channel MAC - IEEE 802.11. **COs-CO2**

Self-Learning Topics:

UNIT-III: **15 Hours**

Routing Protocols And Transport Layer In Ad Hoc Wireless Networks: Routing Protocol: Issues in designing a routing protocol for Adhoc networks, Classification, proactive routing ,reactive routing(on- demand), hybrid routing, Transport Layer protocol for Ad hoc networks, Design Goals of a Transport Layer Protocol for dHocWirelessNetworks,ClassificationofTransportLayersolutions-TCPover Ad hoc wireless, Network Security, Security in Ad Hoc Wireless Networks, Network Security Requirements. **COs-C03**

UNIT-IV: **12 Hours**

Wireless Sensor Networks (WSNS) and Mac Protocols: Single node architecture - hardware and software components of a sensor node, **WSN Network architecture:** typical network architectures, data relaying and aggregation strategies, **MAC layer protocols:** self-organizing, Hybrid TDMA/FDMA and CSMA based MAC -IEEE 802.15.4. **COs-C04**

UNIT-V: **10 Hours**

WSN Routing, Localization & Qos: Issues in WSN routing, OLSR, Localization, Indoor and Sensor Network Localization, absolute and relative localization, triangulation, QOS in WSN, Energy Efficient Design, Synchronization. **COs-C05**

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Text Books:

1) "AdHocWirelessNetworks:ArchitecturesandProtocols",C.SivaRamMurthy,and B.S. Manoj, Pearson Education, 2008
2) "WirelessAdhocandSensorNetworks",Labiod.H,Wiley,1st edition-2008
3) "Wireless ad -hoc and sensor Networks: theory and applications", Li, X, Cambridge University Press, fifth edition-2008.

Reference Books:

1) "AdHoc& Sensor Networks: Theory and Applications", 2ndedition, Carlos De Morais Cordeiro, Dharma Prakash Agrawal ,World Scientific Publishing Company, 2011
2) "Wireless Sensor Networks", Feng Zhao and Leonides Guibas, Elsevier Publication2nd edition- 2004
3) "ProtocolsandArchitecturesforWirelessSensorNetworks",HolgerKarlandAndreas Willig,Wiley, 2005 (soft copy available)
4) "Wireless Sensor Networks Technology, Protocols, and Applications", Kazem Sohraby, Daniel Minoli, &TaiebZnati, John Wiley, 2007. (soft copy available)

Web References:

1) https://keras.io/datasets/
2) http://deeplearning.net/tutorial/deeplearning.pdf
3) https://arxiv.org/pdf/1404.7828v4.pdf
4) https://github.com/lisa-lab/DeepLearningTutorials

R24MCA4102 NETWORKPROGRAMMING 3 0 0 3

Course Objectives:

- Student able to learn about the protocols which are using in the current scenario.
- To learn and understand client server relations and OSI programming Implementation of the socket and IPC.

5 Evaluate the performance of sensor networks and identify bottlenecks

Course Code	Course Outcomes	Mapping with POs and PSOs					Dok
		PO1	PO2	PO3	PS01	PS02	
R24MCA4102.1	Explain OSI Model and Standard Internet Protocols	3	-	2	3	-	L1, L3
R24MCA4102.2	How to handle server process termination	3	3	-	3	2	L3
R24MCA4102.3	Acquire the knowledge of Elementary TCP sockets and I/O Multiplexing and socket	3	3	-	3	-	L1,L2,L3
R24MCA4102.4	Demonstrate the concepts of FIFOs streams messages and Remote logins	3	-	3	3	-	L4, L5
R24MCA4102.5	Explain OSI Model and Standard Internet Protocols	3	-	2	2	-	L3, L4

SYLLABUS

UNIT-I: Introduction to the 'NETWORK' Programming **13 Hours**

Introduction to Network Programming: OSI model, Unix standards, TCP and UDP& TCP connection establishment and Format, Buffer sizes and limitation, standard internet services, Protocol usage by common internet application. **COs-C01**

Self-Learning Topics:

UNIT-II: **10 Hours**

TCP client server: Introduction, TCP Echo server functions, Normal startup, terminate and signal handling server process termination, Crashing and Rebooting of server host shutdown of server host. **COs-C02**

Self-Learning Topics:

UNIT-III: **15 Hours**

Sockets: Address structures, value – result arguments, Byte ordering and manipulation function and related functions Elementary TCP sockets–Socket, connect, bind, listen, accept, fork and exec function, concurrent servers. Close function and related function.

I/O Multiplexing and socket options: I/O Models, select function, Batch input, shutdown function, poll function, TCP Echo server, getsockopt and setsockopt functions. Socket states, Generic socket option IPV6 socket optionICMPV6 socket option IPV6 socket option and TCP socket options. **COs-C03**

UNIT-IV: **15 Hours**

Elementary UDP sockets: Introduction UDP Echo server function, lost datagram, summary of UDP example, Lack of flow control with UDP, determining outgoing interface with UDP.

Elementary name and Address conversions: DNS, gethost by Name function, Resolver option, Function and IPV6 support, uname function, other networking information. **COs-C04**

UNIT-V: **12 Hours**

IPC : Introduction, File and record locking, Pipes, FIFOs streams and messages, Name spaces, system IPC, Message queues, Semaphores. **Remote Login:** Terminal line disciplines, Pseudo-Terminals, Terminal modes, Control Terminals, rlogin Overview, RPC Transparency Issues. **COs-C05**

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Text Books:

1) UNIX Network Programming, Vol. I, Sockets API, 2nd Edition.- W.Richard Stevens, Pearson Edn. Asia.
2) UNIX Network Programming,1stEdition,-W.Richard Stevens. PHI.

References Books:

1) UNIX Systems Programming using C++ TCHAN, PHI.
2) UNIX for Programmers and Users , 3rd Edition Graham GLASS, Kingabls, Pearson Education
3) Advanced UNIX Programming 2nd Edition M.J.ROCHKIND, Pearson Education

Web References:

1) https://keras.io/datasets/
2) http://deeplearning.net/tutorial/deeplearning.pdf
3) https://arxiv.org/pdf/1404.7828v4.pdf

R24MCA4102 BLOCK CHAIN TECHNOLOGIES **3 0 0 3**

Course Objectives:

8. Impart strong technical understanding of Blockchain technologies.
9. Develop familiarity of current technologies, tools, and implementation strategies
10. Introduce application areas, current practices, and research activity
11. At the end of the course, student will be able to

Course Code	Course Outcomes	Mapping with POs and PSOs					Dok
		PO1	PO2	PO3	PS01	PS02	
R24MCA4102.1	Demonstrate the foundation of the Blockchain technology and understand the processes in payment and funding.	3	-	2	3	-	L1, L3
R24MCA4102.2	Identify the risks involved in building Blockchain applications.	3	3	-	3	2	L3
R24MCA4102.3	Review of legal implications using smart contracts.	3	3	-	3	-	L1,L2,L3
R24MCA4102.4	Choose the present landscape of Blockchain implementations and Understand Cryptocurrency markets.	3	-	3	3	-	L4, L5
R24MCA4102.4	Examine how to profit from trading cryptocurrencies.	3	-	3	3	-	L4, L5

SYLLABUS

UNIT-I: Introduction to the 'NETWORK' Programming **15 Hours**

The consensus problem, Asynchronous Byzantine Agreement, AAP protocol and its analysis, Nakamoto Consensus on permission-less, nameless, peer-to-peer network, Abstract Models for BLOCKCHAIN, GARAY model, RLA Model, Proof of Work (PoW) as random oracle, formal treatment of consistency, liveness and fairness - Proof of Stake (PoS) based Chains, Hybrid models (PoW + PoS). **COs-C01**

Self-Learning Topics:

UNIT-II: **9 Hours**

cryptographic basics for cryptocurrency, A short overview of Hashing, signature schemes, encryption schemes and elliptic curve cryptographyhost. **COs-C02**

UNIT-III: **9 Hours**

Bitcoin, Wallet, Blocks, Merkley Tree, hardness of mining, transaction verifiability, anonymity, forks, double spending, mathematical analysis of properties of Bitcoin. **COs-C03**

UNIT-IV: **8 Hours**

Ethereum: Ethereum Virtual Machine (EVM),Wallets for Ethereum, Solidity, Smart Contracts, some attacks on smart contracts **COs-C04**

UNIT-V: **8 Hours**

(Trends and Topics): Zero Knowledge proofs and protocols in Blockchain, Succinct non interactive argument for Knowledge (SNARK), pairing on Elliptic curves ,Zcash. **COs-C05**

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Text Books:

5. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016. (Free download available)
6. UNIX Network Programming, 1st Edition, - W.Richard Stevens. PHI.

Reference Books:

6. Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, IEEE Symposium on security and Privacy, 2015 (article available for free download) {curtain raiser kind of generic article, written by seasoned experts and pioneers}.
7. J.A.Garay et al, The bitcoin backbone protocol - analysis and applications EUROCRYPT 2015 LNCS VOl 9057, (VOLII), pp 281-310. (Also available at eprint.iacr.org/2016/1048). (serious beginning of discussions related to formal models for bitcoin protocols).
8. R.Pass et al, Analysis of Blockchain protocol in Asynchronous networks , EUROCRYPT 2017, (eprint.iacr.org/2016/454) . A significant progress and consolidation of several principles).

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Web References:

1) https://keras.io/datasets/

2) http://deeplearning.net/tutorial/deeplearning.pdf

3) https://arxiv.org/pdf/1404.7828v4.pdf

4) https://github.com/lisa-lab/DeepLearningTutorials

Web References:

1 https://www.codecademy.com/courses/learn-java/lessons/hello-world-java/exercises/introduction-to-java

2 https://www.w3schools.com/java/java_variables.asp

https://www.geeksforgeeks.org/java/

R24MCA4102 SOFTWARE TESTING METHODOLOGIES **3 0 0 3**

Course Objectives:

12. To study fundamental concepts in software testing and discuss various software testing issues and solutions in software unit, integration, regression and system testing To learn how to plan a test project, design test cases and data, conduct testing, manage software
13. problems and defects, generate a test report To expose the advanced software testing concepts such as object-oriented software testing
14. methods, web-based and component-based software testing To understand software test automation problems and solutions
15. To learn how to write software test documents and communicate with engineers in various forms
16. To learn and understand client server relations and OSI programming Implementation of the socket and IPC.

By the end of the course, the student should have the ability to:

Course Code	Course Outcomes	Mapping with POs and PSOs					Dok
		PO1	PO2	PO3	PS01	PS02	
R24MCA4102.1	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	3	-	2	3	-	L1, L3
R24MCA4102.2	Design and conduct a software test process for a software project	3	3	-	3	2	L3
R24MCA4102.3	Analyze the needs of software test automation	3	3	-	3	-	L1,L2,L3
R24MCA4102.4	Use various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects	3	-	3	3	-	L4, L5
R24MCA4102.5	Basic understanding and knowledge of contemporary issues in software testing, such as component-based, web based and object oriented software testing problems	3	-	3	3	-	L4, L5

R24MCA4102.5	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	3	-	3	3	-	L4, L5

SYLLABUS

UNIT-I: Introduction to the 'NETWORK' Programming **15 Hours**

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 **COs-C01**

Self-Learning Topics:

UNIT-II: **14 Hours**

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 **COs-C02**

UNIT-III: **13 Hours**

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 **COs-C03**

UNIT-IV: **14 Hours**

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 Software Quality Management: Software Quality metrics, SQA models Debugging: process, techniques, correcting bugs. **COs-C04**

UNIT-V: **15 Hours**

Automation and Testing Tools: need for automation, categorization of testing tools, selection of testing tools, Cost incurred, Guidelines for automated testing, overview of some commercial testing tools such as Win Runner, Load Runner, Jmeter and JUnit . Test Automation using Selenium tool. Testing Object Oriented Software: basics, Object oriented testing Testing Web based Systems: Challenges in testing for web based software, quality aspects, web engineering, testing of web based systems, Testing mobile systems **COs-C05**

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Text Books:

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

Reference Books:

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

Web References:

1) https://keras.io/datasets/

2) http://deeplearning.net/tutorial/deeplearning.pdf

3) https://arxiv.org/pdf/1404.7828v4.pdf

4) https://github.com/lisa-lab/DeepLearningTutorials

e-Resources:

1. https://www.tutorialspoint.com/software_testing_dictionary/test_tools.htm

R24MCA4102 BIG DATA ANALYTICS **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 bigdata
3. To learn about stream computing.
4. To know about the research that requires the integration of large amounts of data.

By the end of the course, the student should have the ability to:

Course Code	Course Outcomes	Mapping with POs and PSOs					Dok
		PO1	PO2	PO3	PS01	PS02	
R24MCA4102.1	Identify the need-based tools, viz., Pig and Hive and to handle and formulate an effective strategy to implement a successful Data analytics project	3	-	2	3	-	L1, L3
R24MCA4102.2	Organize the existing technologies and the need of distributed files systems to analyze the big data	3	3	-	3	2	L3
R24MCA4102.3	To Discuss the cluster and classification techniques	3	3	-	3	-	L1,L2,L3
R24MCA4102.4	Analyze the concepts of strem memory and spark models.	3	-	3	3	-	L4, L5
R24MCA4102.5	Explain the use of NoSQL database in data analytics.	3	-	3	3	-	L4, L5

SYLLABUS

UNIT-I: Introduction to the 'NETWORK' Programming **15 Hours**

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 **COs-C01**

Self-Learning Topics:

UNIT-II: **13 Hours**

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 **COs-C02**

UNIT-III: **15 Hours**

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, Naïve Bayes, Baye'sTheorem, Naïve Bayes Classifier. **COs-C03**

UNIT-IV: **12 Hours**

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. **COs-C04**

UNIT-V: **14 Hours**

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. **COs-C05**

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Text Books:

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. MichaelBerthold,DavidJ.Hand,"IntelligentDataAnalysis",Springer,2007.
2. TomWhite"Hadoop:TheDefinitiveGuide"ThirdEdition,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. BillFranks,"TamingtheBigDataTidalWave:FindingOpportunitiesinHugeData Advanced Analytics", John Wiley& sons,2012.
5. GlennJ.Myatt,"MakingSenseofData",JohnWiley&Sons,2007.

6. Pete Warden, "Big Data Glossary", O'Reilly,2011.

7. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", 2 nd Edition, Elsevier, Reprinted2008..

Web References:

1) https://keras.io/datasets/

2) http://deeplearning.net/tutorial/deeplearning.pdf

3) https://arxiv.org/pdf/1404.7828v4.pdf

4) https://github.com/lisa-lab/DeepLearningTutorials

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2. https://www.tutorialspoint.com/software_testing_dictionary/test_tools.htm