MASTER OF COMPUTER APPLICATIONS (MCA)

CHOICE BASED CREDIT SYSTEM (CBCS)

Curriculum and Syllabus

Regular (2024 – 2025)

Enable | Enlighten | Enrich
KARPAGAM
ACADEMY OF HIGHER EDUCATION
(Deemed to be University)
(Established Under Section 3 of UGC Act, 1956)

DEPARTMENT OF COMPUTER APPLICATIONS

FACULTY OF ARTS, SCIENCE, COMMERCE AND MANAGEMENT (FASCM)

KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed to be University)
(Established Under Section 3 of UGC Act, 1956)
(Accredited with A+ Grade by NAAC in the Second Cycle)
Eachanari (Post), Coimbatore – 641 021.
Tamilnadu, India
Phone No. 0422-2980011 - 14 Fax No: 0422-2980022
E mail ID: info@ kahedu.edu.in
Web: www.kahedu.edu.in

KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed to be University)
(Established Under Section 3 of UGC Act, 1956)

FACULTY OF ARTS, SCIENCE, COMMERCE AND MANAGEMENT (FASCM)

POST – GRADUATE PROGRAMME

(MCA)

(REGULAR PROGRAMME)

REGULATIONS
(2024)

CHOICE BASED CREDIT SYSTEM (CBCS)

KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed to be University)
(Established Under Section 3 of UGC Act, 1956)
Eachanari (Post), Coimbatore – 641 021.
(Accredited with A+ Grade by NAAC in the Second Cycle)
Tamilnadu, India
Phone No. 0422-2980011 - 14 Fax No: 0422-2980022
E mail ID: info@ kahedu.edu.in
Web: www.kahedu.edu.in

KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed to be University)
(Established under Section 3 of UGC Act, 1956)
(Accredited with A+ Grade by NAAC in the Second Cycle)
Coimbatore - 641 021, Tamil Nadu, India

FACULTY OF ARTS, SCIENCE, COMMERCE AND MANAGEMENT

MCA DEGREE PROGRAMME

REGULAR MODE
CHOICE BASED CREDIT SYSTEM (CBCS)

REGULATIONS - 2024

The following regulations are effective from the academic year 2024 -2025 and are applicable to the candidates admitted in the MCA Degree programme in the Faculty of Arts, Science, Commerce and Management, Karpagam Academy of Higher Education (KAHE).

1. PROGRAMMES OFFERED, MODE OF STUDY AND ADMISSION REQUIREMENTS

1.1. P.G. PROGRAMMES OFFERED

MCA – MASTER OF COMPUTER APPLICATIONS

1.2. MODE OF STUDY

This programme is offered under Full-Time Regular mode. Candidates admitted under 'Full-Time' should be present in the KAHE during the complete working hours for curricular, co-curricular and extra-curricular activities assigned to them.

1.3. ADMISSION REQUIREMENTS (ELIGIBILITY)

A candidate for admission to the first semester of the MCA Degree Programme shall be required to have passed any Degree Examination of this Karpagam Academy of Higher Education or any other University accepted by the KAHE as equivalent thereto.

2. DURATION OF THE PROGRAMMES

2.1. The minimum and maximum period for completion of the MCA Degree Programme is given below:

Programme	Min. No. of Semesters	Max. No. of Semesters
MCA	4	8

2.2. Each semester normally consists of 90 working days or 525 Instructional hours for full-time mode of study. End Semester Examination shall be conducted at the end of every semester for the respective courses.

3. CHOICE BASED CREDIT SYSTEM

Credits means the weightage given to each course of study by the experts of the Board of Studies concerned. MCA Degree programme is offered under Choice Based Credit System and students can earn a total of 82 credits. Students admitted from Non-Computer UG programmes shall earn an additional of 4 credits in their first semester by undertaking 2 bridge courses for which only ESE theory will be conducted for 100 marks.

4. STRUCTURE OF THE PROGRAMME

Every Programme will have a curriculum and syllabus consisting of core courses, elective courses, open elective, Internship and project work.

a. Major courses

Major courses consist of theory and practical and the examinations shall be conducted at the end of each semester.

b. Elective courses

Elective courses are to be chosen with the approval of the Head of Department concerned from the list of elective courses mentioned in the curriculum.

c. Project Work

The candidates shall undertake the project work in the Third/Fourth Semester either in the Department concerned or in Industries, Research Institute or any other Organizations (National / International) and the project report has to be submitted at the end of the third/fourth semester.

If the candidate undertakes the Research Project work outside the Department, the faculty concerned within the Department shall be the Supervisor and the teacher/scientist of the host institute will be the Co-supervisor. The candidate shall bring the attendance certificate from the host institute.

The Head of the Department shall assign a project supervisor who shall monitor the student's project work(s). A Project Assessing Committee (PAC) shall be constituted with HoD and two senior faculty members of the Department. The PAC shall announce the dates for the reviews and demonstration. The student shall make a presentation on the progress and demonstration of their project before the PAC in the presence of their supervisor on the scheduled dates.

d. Internship

The student shall undergo 15 days internship at the end of second semester and or during the third semester. Internship report will be evaluated and marks will be awarded in the third semester. Students have to earn 2 credits for the Internship. The Internship will be assessed internally and marks will be awarded out of 100.

e. Open Elective

He / She may select one of the open elective courses available in the NPTEL/SWAYAM/SWAYAM PLUS in their second semester or from the list given below offered by other departments in the third semester. Students have to earn 2 credits for this course (The student cannot select a course offered by the parent department).

S.No.	Name of the offering Department	Course Code	Name of the Course
1	English	24EGPOE301	English for Competitive Examinations
2	Commerce	24CMPOE301	Personal Finance and Planning
3	Management	24MBAPOE301	Organizational Behavior
4	Computer Applications	24CAPOE301	Robotics Process Automation
5	Computer Science	24CSPOE301	Cyber Forensics
6	Mathematics	24MMPOE301	Coding theory
7	Physics	24PHPOE301	Electrical Appliances and Servicing
8	Chemistry	24CHPOE301	Industrial Chemistry
9	Microbiology	24MBPOE301	Fermentation Technology
10	Biotechnology	24BTPOE301	Nutrition and Dietetics

5. CREDIT TRANSFER THROUGH ONLINE PLATFORM / INTERNATIONAL STUDIES

Students are encouraged to enroll in courses offered by MOOC platforms and international institutions of higher learning, either virtually or in person. The equivalent credits for these courses will be determined by a committee named Subject Equivalency Committee comprising the Dean, Head of Department (HoD), and one faculty member nominated by the Vice Chancellor. The committee's decision will be submitted for ratification/approval by the Board of Studies (BoS) and the Academic Council. Additionally, the equivalent grade points for marks/grades/grade points awarded by various MOOC platforms and international institutions of

higher learning will be determined by a committee named Grade Equivalency Committee duly constituted by the Vice-Chancellor. The decisions of this committee will also be submitted for ratification/approval by the Academic Council. This shall be approved to be implemented from the even semester of the academic year 2024-25.

6. MEDIUM OF INSTRUCTION

The medium of instruction for all courses, examinations, seminar presentations, Internship and project/thesis/dissertation reports should be English.

7. MAXIMUM MARKS

The maximum marks assigned to different courses shall be as follows:

(i) Each of the theory and practical courses shall carry maximum of 100 marks. Out of which 40 marks are for Continuous Internal Assessment (CIA) and 60 marks are for End Semester Examinations (ESE).

(ii) Maximum Marks for Project work

S. No	Programme	Maximum Marks	CIA	ESE
1	MCA	200	80	120

8. a. FACULTY MENTOR

To help students in planning their courses of study and for general advice on the academic programme, the HoD shall allot a certain number of students to a faculty who will function as mentor throughout their period of study. Faculty mentors shall advise the students and monitor their behavior and academic performance. Problems if any shall be counseled by them periodically. The faculty mentor is also responsible to inform the parents of their wards' progress. Faculty mentor shall display the cumulative attendance particulars of his / her students' periodically (once in 2 weeks) on the Notice Board to enable the students to know their attendance status and satisfy the **clause 8** of this regulation.

9. CLASS COMMITTEE

Every class shall have a Class Committee consisting of teachers of the class concerned, student representatives (Minimum two boys and 2 girls of various capabilities and Maximum of 6 students) and the HoD / senior faculty concerned as a Chairperson. The objective of the class committee

Meeting is all about the teaching – learning process. The Class Committee shall be convened at least once in a month. The constitution and functions of the Class Committee shall include

1. The class committee shall be constituted during the first week of each semester.
2. The Class Committee of a particular class of any department is normally constituted by the HoD/Chairperson of the Class Committee. However, if the students of different departments are mixed in a class, the Class Committee shall be constituted by the respective Dean of the Faculty.
3. The HoD/Chairperson of the Class committee is authorized to convene the meeting.
4. The respective Dean of the Faculty has the right to participate in any Class committee meeting.
5. The Chairperson is required to prepare the minutes of every meeting, and submit the same to the Dean concerned within two days after having convened the meeting. Serious issues if any shall be brought to the notice of the Registrar by the HoD/Chairperson immediately.
6. Analyzing and solving problems experienced by students in the class room and in the laboratories.
7. Analyzing the performance of the students of the class after each test and finding the ways and means to improve the performance.

10. REQUIREMENTS TO APPEAR FOR THE END SEMESTER EXAMINATION

a. Every student is expected to attend all classes and secure 100% attendance. However, in order to allow for certain unavoidable circumstances, the student is expected to attend at least 75% of the classes and the conduct of the candidate should be satisfactory during the course.

b. A candidate who has secured attendance between 65% and 74% (both included), due to medical reasons (Hospitalization / Accident / Specific Illness) or due to participation in University / District / State / National / International level sports or due to participation in Seminar / Conference / Workshop / Training Programme / Voluntary Service / Startup Activity / Extension activities or similar programmes with prior permission from the Registrar shall be given exemption from prescribed minimum attendance requirements and shall be permitted to appear for the examination on the recommendation of the Head of

Department concerned and Dean to condone the shortage of attendance. The Head of Department has to verify and certify the genuineness of the case before recommending to the Dean concerned.

c. However, a student who has secured less than 65% in any of the semesters due to any reasons, shall not be permitted to appear for the End Semester Examinations. But he/she will be permitted to appear for his/her arrear examinations. In order to redo the semester with lack of attendance he/she has to attend the corresponding semester of the subsequent year(s) with approval of the Dean of the Faculty, Dean - Students Affairs and the Registrar.

11. PROCEDURE FOR AWARDING MARKS FOR INTERNAL ASSESSMENT

11.1. Every Faculty is required to maintain an **Attendance and Assessment Record (Log book)** which consists of attendance of students marked for each lecture/practical/ project work, the CIA and Seminar marks and the record of class work completed (topic covered), separately for each course. This should be submitted to the HoD once in a week for checking the syllabus coverage, records of test marks and attendance. The HoD shall sign with date after due verification. The same shall be submitted every fortnight to respective Dean. After the completion of the semester the HoD should keep this record in safe custody for five years as records of attendance and assessment shall be submitted for inspection as and when required by the KAHE/any other approved body.

11.2. Continuous Internal Assessment (CIA): The performance of students in each course will be continuously assessed by the respective faculty. Retest will be conducted and considered based on the requirements and recommendations by the Head of the Department. The guidelines for the Continuous Internal Assessment (CIA) are given below:

Theory Courses

S. No.	Category	Maximum Marks
1	Attendance	5
2	Test – I (2 ½ units)	10
3	Test – II (2 ½ units)	10
4	Journal Paper Analysis & Presentation*	15
	Total	40

*****Evaluated by two faculty members of the department concerned. Distribution of marks for one Journal paper analysis: Subject matter 5 marks, Communication/PPT Presentation 4 marks, Visual aid 2 marks and Question and Discussion 4 marks.

Practical Courses

S. No.	Category	Maximum Marks
1	Attendance	5
2	Observation work	5
3	Record work	5
4	Model practical examination	15
5	*Viva – voce* [Comprehensive]*	10
	Total	**40**

* *Viva - voce* conducted during model practical examination.

Every practical Exercise / Experiment shall be evaluated based on the conduct of Exercise/ Experiment and records maintained.

11.3 Portions for Test Question Paper

Portions for Internal Test – I : 2 ½ Units

Portions for Internal Test – II : 2 ½ Units

11.4 Pattern of Test Question Paper

Theory Courses:
Maximum Marks : 100 **Duration: 3 Hours**

Section	Marks
Part – A	Short Answer Answer ALL the Questions (10 x 2 = 20 Marks)
Part - B	Long Answer – 5 six mark questions 'either – or' type Answer ALL the Questions (5 x 6 = 30 Marks)
Part - C	Essay type Answer– 5 ten mark questions 'either – or 'type Answer ALL the Questions (5 x 10 = 50 Marks)

11.5 Attendance

Marks Distribution for Attendance

S. No.	Attendance (%)	Maximum Marks
1	91 and above	5.0
2	81 - 90	4.0
3	76 - 80	3.0
4	Less than or equal to 75	0

12. ESE EXAMINATIONS

12.1 End Semester Examination (ESE): ESE will be held at the end of each semester for each course. The question paper is for a maximum of 100 marks.

Pattern of ESE Question Paper

Theory Courses:

Maximum Marks: 100 **Duration: 3 Hours**

Section	Marks
Part – A	Short Answer Answer ALL the Questions (10 x 2 = 20 Marks)
Part - B	Long Answer – 5 six mark questions 'either – or' type Answer ALL the Questions (5 x 6 = 30 Marks)
Part - C	Essay type Answer– 5 ten mark questions 'either – or 'type Answer ALL the Questions (5 x 10 = 50 Marks)

The 100 Marks is converted to 60 Marks.

12.2 Practical Courses: There shall be combined valuation by the Internal and External examiners. The pattern of distribution of marks shall be as given below.

S. No.	Category	Maximum Marks
1.	Experiments	40
2.	Record work	10
3.	*Viva – voce* [Comprehensive]	10
	Total	**60**

Record Notebooks for Practical Examination

Candidate taking the Practical Examination should submit Bonafide Record Notebook prescribed for the practical examination, failing which the candidate will not be permitted to take the practical examination.

In case of failures in Practical Examination, the marks awarded for the Record at the time of first appearance of the Practical Examination shall remain the same at the subsequent appearance also by the candidate.

12.3. Evaluation of Project Work

12.3.1 The project shall carry a maximum marks as per (vide clause 6 (ii)). ESE will be a combined evaluation of Internal and External Examiners.

12.3.2 The project report prepared according to the approved guidelines and duly signed by the supervisor(s) shall be submitted to HoD.

Guidelines to prepare the project report

a. Cover page
b. Bonafide certificate
c. Declaration
d. Acknowledgement
e. Table of contents
f. Chapters
    - Introduction
    - Aim and Objectives
    - Materials and Methods (Methodology)
    - Results (Analysis of Data) and Discussion (Interpretation)
    - Summary
    - References

12.3.3 The evaluation of the project will be based on the project report submitted and *Viva-Voce* Examination by a team consisting of the supervisor, who will be the Internal Examiner and an External Examiner who shall be appointed by the COE. In case the supervisor is not available, the HoD shall act as an Internal Examiner.

12.3.4 If a candidate fails to submit the project report on or before the specified date given by Examination Section, the candidate is deemed to be failed in the project work and shall re-enroll for the same in a subsequent semester.

If a candidate fails in the *viva-voce* examinations he/she has to resubmit the project report within 30 days from the date of declaration of the results. For this purpose the same Internal and External examiner shall evaluate the resubmitted report.

12.3.5 Copy of the approved project report after the successful completion of *viva voce* examinations shall be kept in the KAHE library.

13. PASSING REQUIREMENTS

13.1 Passing minimum: A candidate needs to secure a minimum of 20 marks out of 40 marks in CIA and 30 marks out of 60 marks in ESE. The overall passing minimum in each course is 50 marks out of 100 marks (Sum of the marks in CIA and ESE examination).

13.2 If a candidate fails to secure a pass in a particular course (either CIA or ESE or Both) as per clause 17.1, it is mandatory that the candidate has to register and reappear for the examination in that course during the subsequent semester when examination is conducted for the same till, he / she receives pass both in CIA and ESE (vide Clause 2.1).

13.3 Candidate failed in CIA will be permitted to improve CIA marks in the subsequent semesters by writing tests and by re-submitting Assignments.

13.4 The CIA marks secured by the candidate in the first passed attempt shall be retained by the Office of the Controller of Examinations and considered valid for all subsequent attempts till the candidate secures a pass in ESE.

13.5 A Candidate who is absent in ESE in a Course / Practical / Project Work after having enrolled for the same shall be considered to have Absent (AAA) in that examination

14. IMPROVEMENT OF MARKS IN THE COURSE ALREADY PASSED

The Candidates desirous to improve the marks secured in a passed course in their first attempt shall reappear once (**only in ESE**) in the subsequent semester. **The improved marks shall be considered for classification but not for ranking.** If there is no improvement there shall be no change in the marks awarded earlier.

15. AWARD OF LETTER GRADES

All assessments of a course will be done on absolute marks basis. However, for the purpose of reporting the performance of a candidate, letter grades, each carrying certain number of points, will be awarded as per the range of total marks (out of 100) obtained by the candidate in each course as detailed below:

Letter grade	Marks Range	Grade Point	Description
O	91 - 100	10	OUTSTANDING
A+	81 - 90	9	EXCELLENT
A	71 - 80	8	VERY GOOD
B+	66 - 70	7	GOOD
B	61 - 65	6	ABOVE AVERAGE
C	55 - 60	5	AVERAGE
D	50 - 54	4	PASS
RA	< 50	-	REAPPEARANCE
AAA	-	-	ABSENT

16. GRADE SHEET

After the declaration of the results, Grade Sheets will be issued to each student which will contain the following details:

i. The list of courses enrolled during the semester and the corresponding grade obtained.

ii. The Grade Point Average (**GPA**) for the semester and

iii. The Cumulative Grade Point Average (**CGPA**) of all courses enrolled from first semester onwards.

GPA of a Semester and CGPA of a programme will be calculated as follows.

$$\textbf{GPA} \text{ of a Semester} = \frac{\text{Sum of the product of the GP by the corresponding credits of the courses offered in that Semester}}{\text{Sum of the credits of the courses of that Semester}}$$

i.e. **GPA** of a Semester = $\frac{\sum_i CiGPi}{\sum_i Ci}$

Sum of the product of the GPs by the corresponding credits of the courses offered for the entire programme

CGPA of the entire programme = ----------

Sum of the credits of the courses of the entire programme

i.e. **CGPA** of the entire programme = $\frac{\sum_n \sum_i CniGPni}{\sum_n \sum_i Cni}$

where,

Ci is the credit fixed for the course 'i' in any semester
GPi is the grade point obtained for the course 'i' in any semester
'n' refers to the Semester in which such courses are credited

Note: RA grade will be excluded for calculating **GPA** and **CGPA**.

17. REVALUATION

Candidate can apply for revaluation or retotaling of his / her semester examination answer script (**theory courses only**), within 2 weeks from the date of declaration of results, on payment of a prescribed fee. For the same, the prescribed application has to be sent to the Controller of Examinations through the HoD. **A candidate can apply for revaluation of answer scripts not exceeding 5 courses at a time.** The Controller of Examinations will arrange for the revaluation and results will be intimated to the candidate through the HODs concerned**.** Revaluation is not permitted for supplementary theory courses.

18.TRANSPARENCY AND GRIEVANCE COMMITTEE

Revaluation and Re-totaling are allowed on representation (clause 18). Student may get the Xerox copy of the answer script on payment of prescribed fee, if he / she wish. The student may represent the grievance, if any, to the Grievance Committee, which consists of Dean of the Faculty, (if Dean is HoD, the Dean of another Faculty nominated by the

KAHE), the HoD of Department concerned, the faculty of the course and Dean from other discipline nominated by the KAHE and the CoE. If the Committee feels that the grievance is genuine, the script may be sent for external valuation; the marks awarded by the External examiner will be final. The student has to pay the prescribed fee for the same.

19. ELIGIBILITY FOR THE AWARD OF THE DEGREE

A student shall be declared to be eligible for the conferment of the Degree if he / she has

- Successfully completed all the components in clause 3 and gained the required number of total credits as specified in the curriculum corresponding to his / her Programme within the stipulated period.
- No pending disciplinary enquiry/ action against him/her.
- The award of the degree must be approved by the Board of Management.

20.CLASSIFICATION OF THE DEGREE AWARDED

20.1. Candidate who qualifies for the award of the Degree (vide clause 14) having passed the examination in all the courses in his / her first appearance, within the specified minimum number of semesters and securing a **CGPA not less than 8.0** shall be declared to have passed the examination in **First Class with Distinction.**

20.2 Candidate who qualifies for the award of the Degree (vide clause 14) having passed the examination in all the courses within the specified maximum number of semesters (vide clause 2.1), securing a **CGPA not less than 6.5** shall be declared to have passed the examination in **First Class**.

20.3 All other candidates (not covered in clauses 21.1 and 21.2) who qualify for the award of the degree (vide Clause 20) shall be declared to have passed the examination in **Second Class**.

21. RANKING

A candidate who qualifies for the PG Degree programme passing all the Examinations in the first attempt, within the minimum period prescribed for the programme of study from Semester I through Semester IV to the programme shall be eligible for ranking. Such ranking will be confined to 10% of the total number of candidates qualified in that particular programme of Study subject to a maximum of 10 ranks.

The improved marks will not be taken into consideration for ranking.

22. SUPPLEMENTARY EXAMINATION

Supplementary Examination will be conducted only for the final semester students within ten days from the date of publication of results for students who have failed in one theory course only. Such students shall apply with prescribed fee to the Controller of Examinations within the stipulated time.

23.DISCIPLINE

23.1. If a student indulges in malpractice in any of the Internal/External Examinations he/she shall be liable for punitive action as prescribed by the KAHE from time to time.

23.2. Every student is required to observe discipline and decorous behavior both inside and outside the campus and not to indulge in any activity which will tend to bring down the prestige of the KAHE. The erring students will be referred to the disciplinary committee constituted by the KAHE, to enquire into acts of indiscipline and recommend the disciplinary action to be taken.

24. KAHE ENTRANCE EXAMINATION

At the end of Fourth Semester, the KAHE Entrance Examinations will be conducted who are aspiring for Higher Education (Ph.D).

25. REVISION OF REGULATION AND CURRICULUM

Karpagam Academy of Higher Education may from time-to-time revise, amend or change the Regulations, Scheme of Examinations and syllabi if found necessary.

****

PROGRAM OUTCOMES

By the end of the programme, our graduates will

1. **Disciplinary knowledge:** Possess a profound understanding of the foundational concepts, theories, methodologies, and practices within the discipline of Computer Applications.
2. **Communication Skills:** Emerge as confident communicators capable of articulating complex concepts, advocating for their viewpoints, and engaging in meaningful discourse to address contemporary issues and drive positive change.
3. **Critical thinking:** Master advanced critical thinking skills, analyzing complex issues, and solving problems through evidence-based decision-making.
4. **Problem solving:** Excel in problem-solving, applying analytical techniques and creative thinking to address complex challenges in the field of Computer Applications.
5. **Analytical reasoning:** Emerge as adept analytical thinkers, equipped to tackle challenging problems, make informed decisions, and contribute to the advancement of knowledge in the field of Computer Applications.
6. **Research-related skills:** Demonstrate proficiency in data analysis, critical appraisal, and ethical research practices, contributing original insights to the advancements in Computer Applications.
7. **Cooperation/Team work:** Develop strong cooperation and teamwork skills, collaborating effectively with diverse peers to achieve common goals.
8. **Scientific reasoning:** Excel in scientific reasoning, applying logic and evidence to analyze phenomena, solve problems, and advance knowledge in the area of Computer Applications.
9. **Reflective thinking:** Master reflective thinking, fostering self-awareness and insight to evaluate experiences, perspectives, and actions critically.
10. **Information/digital literacy:** Excel information and digital literacy, adeptly locating, evaluating, and ethically using diverse sources of information
11. **Self-directed learning:** Be empowered individuals to take ownership of their educational journey, fostering autonomy, critical thinking, and adaptability.
12. **Multicultural competence:** Be enabled to effectively navigate diverse contexts, fostering empathy, understanding, and collaboration across cultures.
13. **Moral and ethical awareness/reasoning:** Possess the capacity to critically analyze ethical issues from various perspectives and apply ethical principles to real-world situations.
14. **Leadership readiness/qualities:** Develop the skills and attributes necessary to effectively lead and inspire others.
15. **Lifelong learning:** Foster a commitment to lifelong learning by cultivating curiosity, critical thinking, and a growth mindset.

PROGRAM SPECIFIC OBJECTIVES (PSOs):

PSO 1: Apply the scientific knowledge acquired to develop smart applications.

PSO 2: Ability to design and develop software with appropriate documentation.

PSO 3: Apply current tools and techniques to design and develop innovative applications for solving real life challenges.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1: Design, model and develop smart applications by utilizing strong technical and domain knowledge acquired from the programme for the improvement of society.

PEO 2: Apply tools, technologies and critical thinking to develop applications for solving industry oriented problems

PEO 3: Function as a team member and develop projects in a multi-disciplinary environment by emulating leadership skills

MAPPING of PEOs and POs

POs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
PEO1	X	X	X	X	X										
PEO2		X	X	X		X		X		X	X	X	X	X	X
PEO3			X		X	X	X		X		X	X		X	X

DEPARTMENT OF COMPUTER APPLICATIONS
FACULTY OF ARTS, SCIENCE, COMMERCE AND MANAGEMENT (FASCM)
PG PROGRAM (CBCS)
MASTER OF COMPUTER APPLICATIONS (MCA)
(2024–2025 Batch and onwards)

Course Code	Name of the Course	Out comes		Instruction Hours / Week			Credit(s)	Maximum Marks			Page No.
		PSOs	POs	L	T	P		CIA	ESE	Total	
								40	60	100	
SEMESTER - I											
24CAP101A	Problem Solving using Python	1,2	1,3,4, 5,9	5	-	-	4	40	60	100	01
24CAP102A	Advanced Computer Networks	1,2	1,3,5, 9	5	-	-	4	40	60	100	03
24CAP103A	Advanced Data Structures and Algorithm	1,2	1,3,9, 11	5	-	-	4	40	60	100	05
24CAP104A	Mathematical Foundation of Computer Applications	1,2	1,2,3, 4	5	-	-	4	40	60	100	07
24CAP105PE1	Professional Elective - I	3	1,2,5, 6	4	-	-	3	40	60	100	09
24CAP111A	Problem Solving using Python - Practical	1,2	1,3,4, 5	-	-	5	3	40	60	100	10
24CAP112A	Advanced Data Structures and Algorithm - Practical	1,2	1,3,4, 5,6,9	-	-	4	2	40	60	100	12
	Journal Paper Analysis & Presentation	-		2	-	-	-	-	-	-	14
Semester Total				**26**	**0**	**9**	**24**	**280**	**420**	**700**	
SEMESTER - I LTI -MINDTREE											
24CAP101B	Python for Data Science	1,2	1,3,4, 5,6,7	5	-	-	5	40	60	100	15
24CAP102B	Applied Machine Learning	1,2	1,3,5, 6,8,9, 11	4	-	-	4	40	60	100	18
24CAP103B	Data Engineering	1,2	1,3,5, 6,8,9	4	-	-	4	40	60	100	21
24CAP104B	Mathematical Foundation for Data Science	1,2	1,3,5, 6	4	-	-	4	40	60	100	23
24CAP105PE2	Professional Elective - I	1,2	1,3,5, 6	4	-	-	3	40	60	100	25
24CAP106	Professional Soft Skills - I	1,2	1,3,5, 6	3	-	-	2	40	60	100	26
24CAP111B	Data Science - Practical	1,2	1,3,4, 5	-	-	5	3	40	60	100	28
24CAP112B	Applied Machine Learning - Practical	1,2	1,3,4, 5,6,9	-	-	4	3	40	60	100	30
	Journal Paper Analysis & Presentation	-		2	-	-	-	-	-	-	33
Semester Total				**26**	**0**	**9**	**28**	**320**	**480**	**800**	

SEMESTER – II											
24CAP201A	Advanced Java Programming	1,2	1,3,4,5, 6,7	5	-	-	4	40	60	100	34
24CAP202A	Advanced Database Technology	1,2	1,3,5,6, 8,9,11	5	-	-	4	40	60	100	36
24CAP203A	Cyber Security	1,2	1,3,5,6, 8,9	4	-	-	3	40	60	100	38
24CAP204*	Professional Elective - II	1,2	1,3,5,6	5	-	-	3	40	60	100	41
24CAP205*	Professional Elective - III	1,2	1,3,5,6	5	-	-	3	40	60	100	42
24CAP211A	Advanced Java Programming -Practical	1,2	1,3,4,5, 6,8,9	-	-	4	2	40	60	100	43
24CAP212A	Advanced Database Technology -Practical	1,2	1,3,4,5, 6,8,9	-	-	4	2	40	60	100	46
24CAP206	Community Engagement & Social Responsibility	1,2	3,5,7	2			2	100	0	100	48
	Journal Paper Analysis & Presentation	-	-	1	-	-	-	-	-	-	50
Semester Total		**-**	**-**	**27**	**0**	**8**	**23**	**380**	**420**	**800**	
SEMESTER – II LTI -MINDTREE											
24CAP201B	Artificial Intelligence DL	1,2	1,3,4,5, 6,7	4	-	-	4	40	60	100	51
24CAP202B	Generative AI with Large Language Models	1,2	1,3,5,6, 8,9,11	4	-	-	3	40	60	100	54
24CAPOE201	Open Elective	1,2	1,3,5,6, 8,9	3	-	-	3	40	60	100	56
24CAP203B	Professional Soft Skills - II	1,2	1,3,5,6	3			2	40	60	100	57
24CAP204*	Professional Elective – II	1,2	1,3,5,6	5	-	-	3	40	60	100	59
24CAP205*	Professional Elective - III	1,2	1,3,5,6	5	-	-	3	40	60	100	60
24CAP211B	Building GenAI Based Applications- Practical	1,2	1,3,4,5, 6,8,9	-	-	4	3	40	60	100	61
24CAP212B	Large language Models - Practical	1,2	1,3,4,5, 6,8,9	-	-	4	3	40	60	100	64
24CAP206	Community Engagement & Social Responsibility	1,2	3,5,7	2			2	100	0	100	66
	Journal Paper Analysis & Presentation	-	-	1	-	-	-	-	-	-	68
Semester Total		**-**	**-**	**27**	**0**	**8**	**26**	**420**	**480**	**900**	

SEMESTER – III											
24CAP301A	Artificial Intelligence and Machine Learning	1,2	1,3,4, 5,6,8, 9	5	-	-	4	40	60	100	69
24CAP302A	Research Methodology and IPR	1,2	1,3,5, 6,9,13 ,14	5	-	-	3	40	60	100	71
24CAPOE301	Open Elective	1,2	1,3,5, 6,9,13 ,14	3	-	-	2	40	60	100	73
24CAP304*	Professional Elective - IV	1,2	1,3,5, 6	5	-	-	3	40	60	100	74
24CAP305*	Professional Elective - V	1,2	1,3,5, 6	5	-	-	3	40	60	100	75
24CAP311A	Machine Learning - Practical	1,2	1,3,4, 5,6,9	-	-	5	3	40	60	100	76
24CAP312A	Professional Elective IV-Practical*	1,2	1,3,4, 6,8,9	-	-	5	3	40	60	100	78
	Journal Paper Analysis & Presentation	-	-	2	-	-	-	-	-	-	79
24CAP391A	Internship[#]	1,2, 3	-	-	-	-	2	100	-	100	80
Semester Total		-	-	**25**	**0**	**10**	**23**	**380**	**420**	**800**	
SEMESTER – III LTI -MINDTRE											
24CAP301B	Professional Elective - IV	1,3	-	5	-	-	4	40	60	100	81
24CAP391B	Project / Thesis - I	1,2, 3	-	-	-	30	12	100	-	100	82
Semester Total		-	-	**5**	**0**	**30**	**16**	**140**	**60**	**200**	
SEMESTER – IV											
24CAP491	Project and Viva Voce	1,2, 3	-	-	-	-	12	80	120	200	83
Semester Total		-	-	**0**	**0**	**0**	**12**	**80**	**120**	**200**	
Program Total		-	-	**78**	**0**	**27**	**82**	**1120**	**1380**	**2500**	
Program (LTI -MINDTREE) Total		-	-	**58**	**0**	**47**	**82**	**960**	**1140**	**2100**	

Professional Electives	Course Code	Course Name
I Sem	24CAP105PE1	Principles of Management
	24CAP105PE2	Generative Adversarial Networks
II Sem	24CAP204D	Data Mining and Data Warehousing
	24CAP204N	Cryptography and Network Security
	24CAP204S	Object Oriented Software Engineering
	24CAP204W	Advanced Web Technology
	24CAP204DSE1	Ethics in Data Science
	24CAP204DSE2	Computer Vision
	24CAP204DSE3	Natural Language Processing
	24CAP205D	Distributed Database Management System
	24CAP205N	TCP/IP
	24CAP205S	Software Design using UML
	24CAP205W	Semantic Web and Ontologies
	24CAP205DSE1	Application Architecture and Deployment
	24CAP205DSE2	Security for Data Science
III Sem	24CAP304D	Introduction to NoSql database
	23CAP304N	Software Defined Network
	24CAP304S	Software Testing and Quality Assurance
	24CAP304W	Full Stack Web Development
	24CAP304DSE1	Machine Learning Engineering for Production Specialization
	24CAP304DSE2	Industry Specific Applications of GenAI & Responsible AI
	24CAP305D	Big Data Analytics
	24CAP305N	Internet of Things
	24CAP305S	Software Metrics
	24CAP305W	Service Oriented Architecture
	24CAP312D	NoSql database - Practical
	23CAP312N	Software Defined Network - Practical
	24CAP312S	Software Testing and Quality Assurance - Practical
	24CAP312W	Full Stack Web Development - Practical

Open Elective Courses

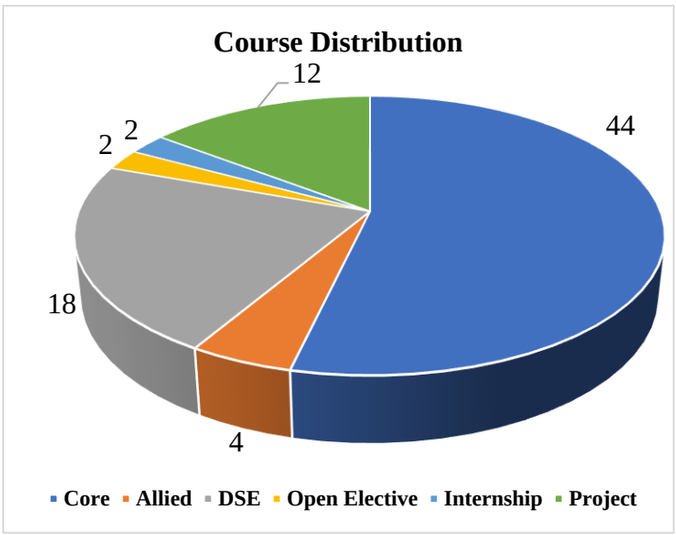
Sl.No	Department	Course Code	Course Name
1	English	24EGPOE301	English for Competitive Examination
2	Commerce	24CMPOE301	Personal Finance and Planning
3	Management	24MBAPOE301	Organizational Behavior
4	Computer Applications	24CAPOE301	Robotics Process Automation
5	Computer Science	24CSPOE301	Cyber Forensics
6	Mathematics	24MMPOE301	Coding theory
7	Physics	24PHPOE301	Electrical Appliances and Servicing
8	Chemistry	24CHPOE301	Industrial Chemistry
9	Microbiology	24MBPOE301	Fermentation Technology
10	Biotechnology	24BTPOE301	Nutrition and Dietetics

Bridge Courses - Only for Non Computer Candidates

Semester	Course Code with Course Name
I	24CAP101B- Problem Solving and Programming In C
	24CAP102B - Foundational Mathematics

Course Distribution

Papers	Theory	Practical	Total
Core	32	12	**44**
Allied	4	-	**4**
DSE	15	3	**18**
Open Elective	2	-	**2**
Internship	-	2	**2**
Project	-	12	**12**
Total	**53**	**29**	**82**



MASTER OF COMPUTER APPLICATIONS **2024-2025**

Semester I

24CAP101A **PROBLEM SOLVING USING PYTHON** **5H-4C**

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To master the Python Programming Fundamentals.
- To able to solve problems methodically using Python.
- To expose to practical, real-world applications of Python programming.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Learn the Python Syntax and Control Statements	Understand
CO2	Explain how to handle Arrays, Strings, and Functions	Understand
CO3	Analyze File Systems and Regular Expressions Operations	Analyze
CO4	Explain and Utilize Data Structures in Python Programs	Apply
CO5	Compare the grid, pack, and place layout managers in Tkinter	Analyze

UNIT I PYTHON BASICS **12 HOURS**

Introduction to Python – Writing our First Python Program – Data types in python- operators in python - Input and Output-Control Statements: if..else - if..elif - while – for - infinite loops - nested loops - else suite – break – continue –pass – assert – return command line arguments.

UNIT II SEQUENTIAL AND NON SEQUENTIAL COLLECTION OPERATIONS 12 HOURS

Arrays in Python: Creating Arrays-Mathematical operations on Arrays- Comparing-Aliasing- Slicing and Indexing-Strings and Characters - Functions: defining – calling - returning results - Formal and Actual arguments- Types of actual arguments-Local and Global variables - Recursive function - Anonymous function - List and Tuples - Dictionaries.

UNIT III OBJECT ORIENTED PROGRAMMING IN PYTHON **12 HOURS**

Introduction to Oops: Features of OOPs - Classes and Objects: Creating a class – self variable – constructor – types of variables and methods – passing members – inner classes - Inheritance and Polymorphism - Abstract classes and Interfaces - Exceptions.

UNIT IV PYTHON ADVANCES **12 HOURS**

Files: Types - open, close and working file - Binary files- with statement – seek() and tell() methods- Access binary files – zipping and unzipping files – Working with directories - Regular Expressions in Python-Date and Time: combining -formatting - comparing – sorting - Working with Calendar module.

UNIT V GRAPHICAL USER INTERFACE **12 HOURS**

GUI in Python: Root Window - Fonts and Colors- Working with Containers- Canvas- Frame- Types of Widget: button-label – message – text – scrollbar - checkbutton – radiobutton – entry – spinbox - listbox - menu- Creating Tables- Pythons Database Connectivity - CRUD operations.

TOTAL: 60 HOURS

TEXT BOOKS:

1. Nageswara Rao R, (2021). *Core Python Programming*, 3rd Edition, Dreamtech Press, New Delhi.
2. Kenneth A. Lambert, (2019). *Fundamentals of Python – First Programs*, 2nd Edition, Cengage Publication, New Delhi,

REFERENCE BOOKS:

1. Paul Barry, 2023. Head First Python, 3rd Edition, O'Reilly Media, Beijing.

WEBSITE LINKS:

1. www.php.net/
2. en.wikipedia.org/wiki/PHP
3. www.w3schools.com/PHP/DEfaULT.asp
4. http://www.vlab.co.in/ba-nptel-labs-computer-science-and-engineering
5. http://www.nptelvideos.com/php/php_video_tutorials.php

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	2	3	-	-	-	-	2	-	-	-	-	-	-	-	-
CO2	3	-	2	3	-	-	-	-	2	-	-	-	-	-	-	-	2
CO3	3	-	3	3	3	1	-	1	-	-	-	-	-	-	-	-	-
CO4	3	-	2	3	2	-	-	-	1	-	-	-	-	-	-	-	-
CO5	3	-	3	3	1	1	-	-	-	-	-	-	-	-	-	2	-
Average	3	0	2.4	3	2	1	0	1	1.7	0	0	0	0	0	0	2	2

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester I

24CAP102A **ADVANCED COMPUTER NETWORKS** **5H-4C**

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To focus on advanced networking concepts for next generation network architecture and design.
- To cover SDN and virtualization for designing next generation networks.
- To analyze the different routing algorithms.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Compare the various reference models in Network	Understand
CO2	Analyze the different routing algorithms	Analyze
CO3	Analyze the protocols used in Transport layer	Analyze
CO4	Analyze and describe the working principles of Internet.	Analyze
CO5	Identify the protocols involved at the application layer.	Understand

UNIT I INTRODUCTION & NETWORK LAYER **12 HOURS**

Network applications, network hardware, network software, reference models: OSI, TCP/IP, Internet, Connection-oriented network - X.25, frame relay, Protocol. Network layer: Network Layer Services, Packet Switching, Performance, provided transport layers, implementation connectionless services, implementation connection-oriented services, comparison of virtual –circuit and datagram subnets. IPV4 Address, Forwarding of IP Packets, Internet Protocol, ICMP v4, Mobile IP

UNIT II ROUTING ALGORITHMS **12 HOURS**

Routing Algorithms–Distance Vector routing, Link State Routing, Path Vector Routing, Unicast Routing Protocol-Internet Structure, Routing Information Protocol, Open Source Path First, Border Gateway Protocol V4, Broadcast routing, Multicasting routing, Multicasting Basics, Intradomain Multicast Protocols, IGMP.

UNIT III TRANSPORT LAYER **12 HOURS**

IPv6 Addressing, IPv6 Protocol, Transition from IPv4 to IPv6.Transport Layer Services, connectionless versus connection oriented protocols. Transport Layer Protocols: Simple Protocol, Stop and Wal, Go-Back-N, Selective repeat, Piggy Backing. UDP: User datagram, Services, Applications. TCP: TCP services, TCP features, segment, A TCP connection, Flow control, error control, congestion control.

UNIT IV INTERNET LAYER **12 HOURS**

SCTP: SCTP services SCTP features, packet format, An SCTP association, flow control, error control .QUALITY OF SERVICE: flow characteristics, flow control to improve QOS: scheduling, traffic shaping, resource reservation, admission control.

UNIT V APPLICATION LAYER **12 HOURS**

Domain name system, electronic mail, World Wide Web: architectural overview, dynamic web document and http. APPLICATION LAYER PROTOCOLS: Simple Network Management Protocol, File Transfer Protocol, Simple Mail Transfer Protocol, Telnet.

TOTAL: 60 HOURS

TEXT BOOKS:

1. A. S. Tanenbaum, 2022. Computer Networks, 6th edition, Pearson Education/ PHI, New Delhi, India.
2. Stallings W, 2024. Data and Computer Communications, 10th edition, Pearson Education India.

REFERENCE BOOKS:

1. Douglas E Comer, 2015. Internet Working with TCP/IP Volume -1, Sixth Edition, Addison-Wesley Professional.
2. Goransson P, Black C, Culver T, 2016. Software Defined Networks: a Comprehensive Approach, Morgan Kaufmann.

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-
CO2	3	-	3	2	3	1	-	1	2	1	-	-	-	-	-	1	-
CO3	3	-	3	-	3	1	-	1	2	1	-	-	-	-	-	-	-
CO4	3	-	3	1	3	1	-	1	2	1	1	-	-	-	-	-	-
CO5	3	-	1	-	-	-	-	-	2	-	-	-	-	-	-	-	1
Average	**3**	**0**	**2.5**	**1.5**	**3**	**1**	**0**	**1**	**1.8**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**1**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester I

24CAP103A ADVANCED DATA STRUCTURES AND ALGORITHM 5H-4C

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

- Proficiency in fundamental data structures such as arrays, linked lists, stacks, queues, trees.

COURSE OBJECTIVES (CO):

- To learn and use hierarchical data structures and its operations.
- To learn the usage of graph and its applications.
- To select and design data structures and algorithms that is appropriate for problems.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Demonstrate the usage of algorithms in computing	Understand
CO2	Classify the linear data structures	Understand
CO3	Explain tree and perform various operations on a tree	Understand
CO4	Examine the solution for solving various computing problems using graph data structure	Analyze
CO5	Solve sorting, searching and merging problems for input elements	Create

UNIT I ROLE OF ALGORITHMS IN COMPUTING & COMPLEXITY ANALYSIS 12 HOURS

Algorithms – Algorithms as a Technology -Time and Space complexity of algorithms- symptotic analysis-Average and worst-case analysis-Asymptotic notation-Importance of efficient algorithms - Program performance measurement - Recurrences: The Substitution Method – The RecursionTree Method- Data structures and algorithms. Data Structures: Types of Data Structure – Need of Data Structures.

UNIT II LINKED LISTS, STACKS AND QUEUES 12 HOURS

Introduction - Representation and Operations: Linear Linked List - Doubly Linked List– Circular Linked List – Header Linked Lists Applications of Linked list -Stacks: Operations on stacks-Representation of a stack in memory – Applications of stack – Queues: Operations – Representation of Queues in memory – Applications of Queues.

UNIT III TREES 12 HOURS

Introduction – Tree terminology – Binary trees – Tournament trees – Binary search trees: Representation of a binary and Binary search tree –Operations on binary and Binary search tree – Creation – Traversal – AVL Trees – Threaded binary trees – B Tree – B+ Trees – Red Black Trees – Properties – Implementations – Heap – Heap Implementation.

UNIT IV GRAPHS **12 HOURS**

Introduction – Graph terminology – Representation of Graphs –Operations on Graphs – Applications of Graph - Topological Sort – Minimum Spanning Tree – Kruskal and Prims Algorithm - Finding Shortest paths – Bellman Ford Algorithm – Dijkstra's Algorithm - Articulation Points, Bridges, and Biconnected Components, Strongly connected components – Eulerian Tour – Hamiltonian Tour.

UNIT V – HASHING, SORTING, SEARCHING AND DYNAMIC PROGRAMMING 12 HOURS

Introduction – Direct Address table - Hash Table – Hash Function – Rehashing - Bubble sort – Selection sort –Insertion Sort – Bucket / Radix Sort - Merge Sort – Quick Sort – Heap Sort – Tree sort – Shell Sort – Searching: Linear – Binary search. Dynamic Programming: Elements of Dynamic Programming – Greedy Algorithm – Huffman Coding.

TOTAL: 60 HOURS

TEXT BOOKS:

1. S.Sridhar.(2014). *Design and Analysis of Algorithms*, Oxford University Press, 1st Edition.
2. R.S.Salaria, (2022). *Data structures & Algorithms Using C*, 5th Edition, Khanna Book Publishing Co.Pvt. Ltd.,SRS Enterprises, New Delhi.

REFERENCE BOOKS:

1. ReemaThareja, (2018). Data Structures using C, 2ndEdition, Oxford University Press, New Delhi.
2. Jean Paul Tremblay and Paul G. Sorensen, (2017). An Introduction to Data Structures with Applications, 2nd Edition, Tata McGraw Hill, New Delhi.

WEBSITE LINKS:

1. https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/
2. https://techdevguide.withgoogle.com/paths/data-structures-and-algorithms/
3. https://www.programiz.com/dsa

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	1	3	1	2	-	-	-	-	1	-
CO2	3	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
CO3	3	-	-	-	2	1	-	1	2	-	-	-	-	-	-	-	1
CO4	3	-	3	2	3	2	-	2	-	-	-	-	-	-	-	-	-
CO5	3	-	3	3	3	2	-	1	3	-	-	-	-	-	-	-	-
Average	3	0	3	2.5	2.7	1.7	0	1.3	2.5	1	2	0	0	0	0	1	1

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester I

24CAP104A **MATHEMATICAL FOUNDATION OF COMPUTER APPLICATIONS** **5H-4C**

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To apply matrix algebra in computer graphics, cryptography, and data analysis.
- To use set theory in database management and software development.
- To apply probability theory in areas like machine learning and cryptography.
- To conduct hypothesis testing with statistical tools and techniques.
- To use PERT and CPM for efficient project scheduling in software development.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Apply matrix algebra techniques to solve computational problems in fields like computer graphics, cryptography, and data analysis.	Understand
CO2	Construct logical arguments and Manipulate sets and relations in various disciplines.	Analyze
CO3	Analyze uncertainty and apply probability distributions in real-world scenarios	Apply
CO4	Articulate testing of hypothesis to interpret the results.	Analyze
CO5	Proficiently schedule and manage projects using PERT and CPM techniques, ensuring efficient resource utilization.	Apply

UNIT I MATRIX ALGEBRA **12 HOURS**

Matrices – Rank of a matrix – Solving system of equation – Eigen values and Eigen vectors – Cayley – Hamilton theorem – Inverse of a matrix.

UNIT II MATHEMATICAL LOGIC **12 HOURS**

Propositional Logic - Propositional Equivalences - Predicates and Quantifiers - Rules of Inference. Sets - Operations on sets - Inclusion -exclusion principle - Pigeonhole principle - Relations and their properties - Closures of relations - Equivalence relations -Partial orderings.

UNIT III PROBABILITY DISTRIBUTIONS **12 HOURS**

Probability – The axioms of probability – Conditional probability – Baye's Theorem, Discrete and Continuous random variables – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

UNIT III – TESTING OF HYPOTHESIS **12 HOURS**

Testing of Hypothesis: Introduction to Inferential Statistics: Null and alternative hypothesis, Type I and Type II errors, Standard error, level of significance, acceptance and rejection regions and procedure for testing hypothesis. Large sample test - Z test - tests for means, variances and proportions, small sample tests based on t, F and Chi- square distributions.

UNIT V SCHEDULING BY PERT AND CPM **12 HOURS**

Network Construction – Critical Path Metod – Project Evaluation and Review Technique - Resource Analysis in Network Scheduling.

TOTAL: 60 HOURS

TEXT BOOKS:S:

1. Bronson, R, (2011). *Matrix Operation, Schaum's outline series*, Tata McGraw Hill, New York.
2. Sharma. J. K, (2011). *Discrete Mathematics*, Third Edition, Rajiv Beri for Macmillan Publishers India Ltd. New Delhi.

REFERENCE BOOKS::

1. Veerarajan, (2017). *Fundamentals of Mathematical Statistics*, Yesdee Publishing Pvt Ltd.
2. Pillai.R.S.N, Bagavathy, (2002). *Statistics*, S. Chand & Compony Ltd, New Delhi.
3. Kandiswarup. P. K. Gupta and Man Mohan, (2011). *Operations Research*, 12th Revised Editions, S. Chand & Sons Education Publications, New Delhi.

WEBSITE LINKS

1. https://www.stat.cmu.edu/~ryantibs/statcomp/
2. https://www.stat.cmu.edu/~cshalizi/statcomp/
3. https://www.r-project.org

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	3	3	3	-	-	-	-	-	2	1	2	-	-	-	-	-
Average	3	3	3	3	2	2	0	0	0	2	1	2	0	0	0	0	0

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester I

24CAP105PE1 **PROFESSIONAL ELECTIVE - 1** **4H-3C**

Instruction Hours / Week: L: 4 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

24CAP111A PROBLEM SOLVING USING PYTHON - PRACTICAL 5H-3C

Instruction Hours / Week: L: 0 T: 0 P: 5 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To implement different file handling operations such as reading from and writing to files, handling exceptions, and manipulating file content.
- To develop Python code to interact with databases using libraries like SQLite or MySQL, including CRUD operations (Create, Read, Update, Delete).
- To explore various GUI controls (widgets) using libraries like Tkinter or PyQt to create interactive graphical user interfaces and understand their performance implications.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Apply the fundamental concepts of python programming on real time applications	Apply
CO2	Construct python code to perform various operations using sequential and non-sequential collections	Create
CO3	Develop python applications using object oriented programming concepts	Create
CO4	Apply operations on files, search the patterns using regular expression and working with date and time modules	Apply
CO5	Develop real-time applications to know about the interaction between front-back end.	Create

List of Programs **TOTAL: 60 HOURS**

1. Explore the concept of control statement and functions in simple python programs.
2. Write a python code to perform various operations with strings and arrays
3. Perform various Searching methods – Linear Search & Binary Search
4. Perform various Sorting methods – Selection Sort, Insertion Sort, Merge Sort, Quick Sort.
5. Perform various operations in tuple and list
6. Perform various operations in Dictionary
7. Show the performance Date and Time module in Python
8. Design a python program to implement different types of file functions
9. Develop a Python code to interact with Databases
10. Show the performances of various controls in GUI Programming
11. Practice the techniques in data science to extract the knowledge
12. Show the functions of Matplotlib to visualize the data

TOTAL: 60 HOURS

TEXT BOOKS:

1. Nageswara Rao R, (2021). *Core Python Programming*, 3rd Edition, Dreamtech Press, New Delhi.
2. Kenneth A. Lambert, (2019). *Fundamentals of Python – First Programs*, 2nd Edition, Cengage Publication, New Delhi.

REFERENCE BOOK:

1. Paul Barry, (2023). *Head First Python*, 3rd Edition, O'Reilly Media, Beijing.

WEBSITE LINKS:

1. www.php.net/
2. en.wikipedia.org/wiki/PHP
3. www.w3schools.com/PHP/DEfaULT.asp
4. http://www.vlab.co.in/ba-nptel-labs-computer-science-and-engineering
5. http://www.nptelvideos.com/php/php_video_tutorials.php

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	3	2	-	2	-	1	2	1	-	-	-	-	-	1	-
CO2	3	-	3	-	3	2	-	-	2	-	-	-	-	-	-	-	-
CO3	3	-	3	3	2	2	-	-	1	-	1	-	-	-	-	-	2
CO4	3	-	3	3	2	2	-	-	2	-	-	-	-	-	-	-	-
CO5	3	2	3	3	3	2	2	1	-	-	1	-	-	-	-	-	2
Average	**3**	**2**	**3**	**2.8**	**2.5**	**2**	**2**	**1**	**1.8**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**2**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester I

24CAP112A ADVANCED DATA STRUCTURES AND ALGORITHM - PRACTICAL **4H-2C**

Instruction Hours / Week: L: 0 T: 0 P: 4 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To implement stack operations (push, pop, peek) using an array-based data structure.
- To explore algorithms related to maintaining balance (AVL trees, Red-Black trees) for efficient search and retrieval.
- To implement merge sort and quick sort algorithms for sorting lists of numbers.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Solve the problems using linear data structures	Create
CO2	Construct a tree and perform various operations on a tree along with implementation	Create
CO3	Examine the solution for solving various computing problems using graph data structure	Analyze
CO4	Make use of Hashing Techniques to generate hash address and to resolve the collision on it	Apply
CO5	Design sorting, searching and merging of input elements	Create

List of Programs **TOTAL: 48 HOURS**

1. Implementation of singly Linked List Operations
2. Develop a program to perform various stack operations using an array
3. Implement a Program using Queue Data Structures.
4. Implementation of a Binary Search Tree
5. Implement binary tree traversal: in-order, pre-order, post-order
6. Construct a Minimum Spanning Tree
7. Sort characters by frequency Using Hash table
8. Write a program to implement hash table.
9. Sort the given List of Numbers using topological sort
10. Performing Linear and Binary Search
11. Performing Bubble Sort and Insertion Sort
12. Sort the given List of Numbers using Merge and Quick Sort

TOTAL: 48 HOURS

TEXT BOOKS:

1. R.S.Salaria, (2022). *Data structures & Algorithms Using C*, 5th Edition, Khanna Book Publishing Co.Pvt. Ltd.,SRS Enterprises, New Delhi.
2. ReemaThareja, (2018). *Data Structures using C*, 2nd Edition, Oxford University Press, New Delhi.

REFERENCE BOOKS:

1. Jean Paul Tremblay and Paul G. Sorensen, (2017). *An Introduction to Data Structures with Applications*, 2nd Edition, Tata McGraw Hill, New Delhi.

WEBSITE LINKS:

1. https://www.gatevidyalay.com/algorithms/
2. http://www.vssut.ac.in/lecture_notes/lecture1428551222
3. https://aunotes.in/t/cs8451-design-and-analysis-of-algorithms-notes/939
4. https://www2.cs.duke.edu/courses/fall08/cps230/Book

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	3	3	2	2	-	1	2	-	2	-	-	-	-	2	-
CO2	3	-	3	2	2	2	-	1	2	1	-	-	-	-	-	-	-
CO3	3	-	3	2	2	2	-	1	2	-	-	-	-	1	-	-	3
CO4	3	-	2	2	2	2	-	1	2	-	-	-	-	-	-	-	-
CO5	3	-	3	3	2	2	-	1	2	-	-	-	-	-	-	-	3
Average	**3**	**-**	**2.8**	**2.4**	**2**	**2**	**-**	**1**	**2**	**1**	**2**	**-**	**-**	**1**	**-**	**2**	**3**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

SEMESTER I

JOURNAL PAPER ANALYSIS & PRESENTATION **2H-0C**

Instruction Hours / Week: L:2 T:0 P:0 **Marks:** Internal**:00** External**:00** Total**:000**

End Semester Exam: 3 Hours

24CAP101B **PYTHON FOR DATA SCIENCE** **5H-5C**

Instruction Hours / Week: L:5 T:0 P:0 **Marks:** Internal**:40** External**:60** Total**:100**

End Semester Exam:3Hours

PREREQUISITE:

- Probability and Statistics, Programming Skills, Python Libraries

COURSE OBJECTIVES (CO):

- To understand the basics of Python syntax and semantics.
- To create interactive visualizations using libraries like Plotly.
- To implement machine learning algorithms such as linear regression, decision trees, and clustering.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Understand the concepts of the various programming constructs of Python programming	Understand
CO2	Make use of object oriented concepts to solve real world problems	Remember
CO3	Analyze the basics of python and standard modules used for data science with hands-on.	Analyze
CO4	Understand the data structures and visualization used for data science with hands-on.	Understand
CO5	Evaluate the machine learning libraries used for data science with hands-on.	Evaluate

UNIT I PYTHON - DATA STRUCTURES, OOPS & MODULES **12 HOURS**

Data structures: Dictionaries - Maps - Hash Tables - Array Data Structures - Records - Structs - Data Transfer Objects - Sets and Multisets-Stacks (LIFOs) - Queues (FIFOs) ; Python : Python installation - Python OOPs - Polymorphism in OOPs programming - Python String Concatenation - Print Exception in Python - Python Libraries - Python Pandas - Python Matplotlib - Python Seaborn - Python SciPy - Chatbot in Python - Machine Learning using Python - Exploratory Data Analysis in Python - Open CV Python - Tkinter - Pythons Turtle Module - PyGame in Python - Pytorch - Scrapy - Web Scraping - Django - Python Programs - Types of Data structure in Python - Built in data structures - User defined data structures; Object Oriented Concepts and Design : APIs and Data Collection - Simple API - REST APIs & HTTP Requests - Web scraping - HTML for Web Scraping - file formats

UNIT II PYTHON – NUMPY, PANDAS & DS LIBRARIES **12 HOURS**

Installation and setup : Anaconda Distribution - Anaconda Navigator to create a New Environment - Startup and Shutdown Process - Intro to the Jupyter Lab Interface - Code Cell - execution; Python : Basic datatypes - Operators - variables - Built in Functions - Custom Functions - String Methods - Lists - Index Positions

and Slicing - Navigating Libraries using Jupyter Lab; Series : Create series object from a list and dictionary - The head and Tail methods - Passing Series to Python Built-In Functions – Methods for Data sorting ; Dataframe : Methods and Attributes between Series and DataFrames - Fill in Missing Values - Filtering data and methods in Dataframe - Data Extraction in dataframes -Working with Text Data - Merging Dataframes; Data Mining - Data Processing and Modelling - Data Visualization

UNIT III VISUALIZATION **12 HOURS**

Introduction to Matplotlib - Matplotlib Basics - Matplotlib - Understanding the Figure Object - Matplotlib - Implementing Figures and Axes - Matplotlib - Figure Parameters - Matplotlib Styling - Legends - Matplotlib Styling - Colors and Styles - Advanced Matplotlib Commands - Introduction to Seaborn - Scatterplots with Seaborn - Distribution Plots - Part One - Understanding Plot Types - Distribution Plots - Part Two - Coding with Seaborn - Categorical Plots - Statistics within Categories - Understanding Plot Types - Categorical Plots - Statistics within Categories - Coding with Seaborn - Categorical Plots - Distributions within Categories - Understanding Plot Types - Categorical Plots - Distributions within Categories - Coding with Seaborn - Seaborn - Comparison Plots - Understanding the Plot Types - Seaborn - Comparison Plots - Coding with Seaborn - Seaborn Grid Plots - Seaborn - Matrix Plots.

UNIT IV REGRESSION AND CLASSIFICATION **12 HOURS**

Introduction to Linear Regression : Cost Functions - Gradient Descent - Python coding Simple - Overview of Scikit-Learn and Python - Residual Plots - Model Deployment and Coefficient Interpretation - Polynomial Regression - Theory and Motivation - Creating Polynomial Features - Training and Evaluation - Bias Variance Trade-Off - Polynomial Regression - Choosing Degree of Polynomial - Model Deployment - Feature Scaling; Introduction to Cross Validation : Regularization Data Setup - Ridge Regression Theory - Lasso Regression - Background and Implementation - Elastic Net - Feature Engineering and Data Preparation; Dealing with Outliers - Dealing with Missing Data - Evaluation of Missing Data - Filling or Dropping data based on Rows - Fixing data based on Columns - Dealing with Categorical Data - Encoding Options - Cross Validation - Test - Validation - Train Split - cross_val_score - cross validate - Grid Search; Linear Regression Project: The Logistic Function - Logistic Regression - Theory and Intuition; Linear to Logistic: Logistic Regression - Theory and Intuition - Linear to Logistic Math; Logistic Regression: Theory and Intuition Logistic Regression Model Training - Classification Metrics - Confusion Matrix and Accuracy - Classification Metrics - Precison, Recall, F1-Score - ROC Curves - Logistic Regression with Scikit-Learn - Performance Evaluation - Multi-Class Classification with Logistic Regression - Data and EDA – Model.

UNIT V UNSUPERVISED AND ADVANCED MACHINE LEARNING **12 HOURS**

Introduction to KNN Section: KNN Classification, KNN Coding with Python - Choosing K, KNN Classification Project Exercise; Introduction & history of Support Vector Machines- Hyperplanes and Margins, Kernel Intuition, Kernel Trick and Mathematics; SVM with Scikit-Learn and Python – Classification, Regression Tasks; Introduction to Tree Based Methods- Decision Tree, Understanding Gini Impurity; Constructing Decision Trees with Gini Impurity, Coding Decision Trees; Introduction to Random Forests-Key Hyperparameters, Number of Estimators and Features in Subsets, Bootstrapping and Out-of-Bag Error; Coding Classification with Random Forest Classifier, Coding Regression with Random Forest

Regressor, Advanced Models. Introduction to K-Means Clustering Section; K-Means Color Quantization; K-Means Clustering Exercise Overview, Solution; Introduction to Hierarchical Clustering, Coding - Data and Visualization, Scikit-Learn; Introduction to Principal Component Analysis(PCA)-Manual Implementation in Python-SciKit-Learn.

TOTAL: 60 HOURS

TEXT BOOKS:

1 Fuentes, A. (2018). *Become a Python Data Analyst*. Packet Publishing.

2 Motwani, B. (2020). *Data Analytics using Python*. Wiley.

3 Damji, J. S. (2020). *Learning Spark: Lightning-Fast Data Analytics* (2nd ed.). Shroff/O'Reilly.

REFERENCE BOOKS:

1 Barry, P. (2016). *Head First Python* (2nd ed .). O'Reilly Media.

2 McKinney, W. (2022). *Python for Data Analysis: Data Wrangling with pandas, NumPy, and Jupyter* (3rd ed.). O'Reilly Media.

3 Lambert, K. A. (2019). *Fundamentals of Python – First Programs* (2nd ed.). Cengage Publication.

WEBSITES:

1 http://docs.python.org/3/tutorial/index.html

2 http://interactivepython.org/courselib/static/ pythons

3 http://www.ibiblio.org/g2swap/byteofpython/read/

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	3	2	-	2	-	1	2	1	-	-	-	-	-	1	-
CO2	3	-	3	-	3	2	-	-	2	-	-	-	-	-	-	-	-
CO3	3	-	3	3	2	2	-	-	1	-	1	-	-	-	-	-	2
CO4	3	-	3	3	2	2	-	-	2	-	-	-	-	-	-	-	-
CO5	3	2	3	3	3	2	2	1	-	-	1	-	-	-	-	-	2
Average	**3**	**2**	**3**	**2.8**	**2.5**	**2**	**2**	**1**	**1.8**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**2**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

24CAP102B **APPLIED MACHINE LEARNING** **4H-4C**

Instruction Hours / Week: L:4 T:0 P:0 **Marks:** Internal**:40** External**:60** Total**:100**

End Semester Exam:3Hours

PREREQUISITE:

- Probability and Statistics, Data Mining Concepts

COURSE OBJECTIVES (CO):

- To introduce students to the concepts and techniques of Machine Learning.
- To be able to formulate machine learning problems corresponding to different applications.
- To apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Know about Supervised Learning, Support Vector Machines, Unsupervised Learning	Understand
CO2	Get the knowledge about Feature Engineering, Statistical Data Analysis, Outlier Analysis and Detection	Remember
CO3	Learn about ML Model Development, Model Evaluation Techniques, Model Deployment and Inferences, Model Explainability	Evaluate
CO4	Recognize the importance and value of Operations Research and mathematical modelling in solving practical problems in industry	Apply
CO5	Define and formulate linear programming problems and appreciate their limitations	Analyze

UNIT I SUPERVISED LEARNING **10 HOURS**

Implement and understand the cost function and gradient descent for multiple linear regression - Implement and understand methods for improving machine learning models by choosing the learning rate - plotting the learning curve - performing feature engineering - applying polynomial regression - Implement and understand the logistic regression model for classification -Learn why logistic regression is better suited for classification tasks than the linear regression model is - Implement and understand the cost function and gradient descent for logistic regression - Understand the problem of - overfitting - improve model performance using regularization - Implement regularization to improve both regression and classification models

UNIT II ADVANCED LEARNING ALGORITHMS **10 HOURS**

Build a neural network for binary classification of handwritten digits using TensorFlow - Gain a deeper understanding by implementing a neural network in Python from scratch - Optionally learn how neural network computations are vectorized to use parallel processing for faster training and prediction - Build a neural network to perform multi-class classification of handwritten digits in TensorFlow -using categorical

cross-entropy loss functions and the SoftMax activation - Learn where to use different activation functions – ReLu - linear - sigmoid - SoftMax in a neural network - depending on the task you want your model to perform - Use the advanced Adam optimizer to train your model more efficiently - Discover the value of separating your data set into training - cross-validation -test sets - Choose from various versions of your model using a cross-validation dataset -evaluate its ability to generalize to real- world data using a test dataset - Use learning curves to determine if your model is experiencing high bias or high variance

UNIT III ADVANCED LEARNING ALGORITHMS **10 HOURS**

Learn which techniques to apply regularization - adding more data - adding or removing input features to improve your model's performance - Learn how the bias-variance trade-off is different in the age of deep learning - and apply Andrew Ng's advice for handling bias and variance when training neural networks - Learn to apply the iterative loop of machine learning development to train - evaluate - tune your model - Apply data-centric AI to not only tune your model but tune your data using data synthesis or data augmentation to improve your model's performance - Build decision trees and tree ensembles - such as random forest and XGBoost - boosted trees - to make predictions - Learn when to use neural network or tree ensemble models for your task - as these are the two most commonly used supervised learning models in practice today.

UNIT IV UNSUPERVISED LEARNING **9 HOURS**

Use unsupervised learning techniques for unsupervised learning: including clustering and anomaly detection - Build recommender systems with a collaborative filtering approach and a content-based deep learning method - Build a deep reinforcement learning model - Implement K-mean clustering - Implement anomaly detection - Learn how to choose between supervised learning or anomaly detection to solve certain tasks.

UNIT V RECOMMENDER SYSTEMS **9 HOURS**

Build a recommender system using collaborative filtering - Build a recommender system using a content-based deep learning method - Build a deep reinforcement learning model (Deep Q Network)." - Histograms - Box Plots etc - use of frequency distributions – mean comparisons - cross tabulation - statistical inferences using chi square - t-test and ANOVA - Outlier Analysis and Detection - outlier analysis - density based and distance based.

TOTAL: 48 HOURS

TEXT BOOKS:

1 Li, H. (2023). *Machine Learning Methods*. Springer Nature Singapore.

2 Rao, R. N. (2022). *Machine Learning in Data Science Using Python*. Dreamtech Press.

REFERENCE BOOKS:

1 Alpaydin, E. (2014). *Introduction to Machine Learning* (3rd ed., Adaptive Computation and Machine Learning Series). MIT Press.

2 Aggarwal, C. C. (2018). *Neural Networks and Deep Learning* (1st Kindle ed.).

WEBSITES:

1 https://ai.google/education/

2 https://machinelearningmastery.com/

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
CO2	3	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO3	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
CO4	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO5	3	2	1	-	-	-	1	-	-	-	-	-	-	-	-	-	1
Average	2.4	1.4	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

24CAP103B **DATA ENGINEERING** **4H-4C**

Instruction Hours / Week: L:4 T:0 P:0 **Marks:** Internal**:40** External**:60** Total**:100**

End Semester Exam:3Hours

PREREQUISITE:

- Database Concepts, Programming Skills, Data Analysis Concepts

COURSE OBJECTIVES (CO):

- To understand the fundamentals of data engineering and its importance in modern data-driven applications.
- To representation of complex and voluminous data.
- To identify and design the various components of an Information Retrieval system

COURSE OUTCOMES (COS):

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

COs	Course Outcomes	Blooms Level
CO1	Identify and explain different data formats and their use cases, including structured, semi-structured, and unstructured data.	Apply
CO2	Describe various data ingestion techniques, such as ETL, and stream processing, and their advantages and limitations.	Understand
CO3	Perform data profiling and analyze data quality metrics to ensure data accuracy, completeness, and consistency.	Understand
CO4	Design and implement effective storage and retrieval methods for large-scale data sets, including relational databases, NoSQL databases, and distributed file systems.	Evaluate
CO5	Apply data engineering principles to real-world scenarios, such as data warehousing, big data analytics, and machine learning.	Apply

UNIT I DATA TYPES & FORMATS **10 HOURS**

Introduction to Data Types and Formats - Types of Data - Structured vs. Unstructured Data - Formats of Data - Semi-Structured Data - Data Type Conversion and Transformation - Data Serialization - Choosing the Right Data Type and Format - Tools and Technologies for Data Types and Formats.

UNIT II DATA INGESTION TECHNIQUES **10 HOURS**

Introduction to Data Ingestion - Streaming Data Ingestion - Batch Data Ingestion - Hybrid Data Ingestion - Data Ingestion vs. Data Integration - Data Ingestion Challenges - Tools and Solutions for Data Ingestion - StreamSets DataOps Platform - Benefits of Data Ingestion - Data Ingestion Framework.

UNIT III DATA PROFILING & VISUAL REPRESENTATION VIA VARIOUS TOOLS (PANDAS) **10 HOURS**

Introduction to Data Profiling and Visualization - Exploratory Data Analysis (EDA) with Pandas - Steps Involved in Exploratory Data Analysis (EDA) Data Analysis (EDA) with Pandas - Market Analysis with Exploratory Data Analysis (EDA) - Data Analytics and Its Future Scope - Data Analytics with Python - Top Business Intelligence Tools - Application of Data Analytics - Retrieving and Cleaning Data - Exploratory

Data Analysis and Feature Engineering - Inferential Statistics and Hypothesis Testing - Descriptive Statistics - Types of Descriptive Statistics - Concepts of Populations, Samples, and Variables - Statistical Methods for Describing Data Characteristics - Real-World Applications of Descriptive Statistics using Excel - Types of Missing Data and Handling Techniques.

UNIT IV STORAGE AND RETRIEVAL METHODS **9 HOURS**

Introduction to Storage and Retrieval - Types of Data and Storage Methods - Local vs. Distributed Storage & Retrieval - Hardware Aspects of Storage & Retrieval - Choosing Storage Methods - Data Partitioning and Sharding - Data Replication and Redundancy - Data Compression and Encoding - Data Archiving and Retrieval - Backup and Disaster Recovery - Data Lifecycle Management.

UNIT V DATA LINEAGE ANALYSIS **9 HOURS**

Introduction to Data Lineage Analysis - Building a Data Flow - ETL (Extract, Transform, Load) Process - Usage of Data Warehouse - Edge Intelligence in Data Flow - Understanding Data Lineage - How Data Lineage Works - Benefits of Data Lineage - Data Lineage Tool Features.

TOTAL: 48 HOURS

TEXT BOOKS:

1 Judd, C. M. (2017). *Data Analysis: A Model Comparison Approach To Regression, ANOVA, and Beyond* (3rd ed.). Routledge.

2 Bonnefoy, P.-Y., Chaize, E., Mansuy, R., & Tazi, M. (2024). *The Definitive Guide to Data Integration* (1st ed.). Packt Publishing.

REFERENCE BOOKS:

1 Baeza-Yates, R., & Ribeiro-Neto, B. (2011). *Modern Information Retrieval: The Concepts and Technology behind Search* (2nd ed., ACM Press Books).

2 Reis, J., & Housley, M. (2022). *Fundamentals of Data Engineering: Plan and Build Robust Data Systems*. Grayscale Indian Edition.

WEBSITES:

1 https://www.datacamp.com/tutorial/category/data-engineering

2 https://www.codecademy.com/catalog/subject/data-engineering

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	3	3	2	2	-	1	2	-	2	-	-	-	-	2	-
CO2	3	-	3	2	2	2	-	1	2	1	-	-	-	-	-	-	-
CO3	3	-	3	2	2	2	-	1	2	-	-	-	-	1	-	-	3
CO4	3	-	2	2	2	2	-	1	2	-	-	-	-	-	-	-	-
CO5	3	-	3	3	2	2	-	1	2	-	-	-	-	-	-	-	3
Average	**3**	**-**	**2.8**	**2.4**	**2**	**2**	**-**	**1**	**2**	**1**	**2**	**-**	**-**	**1**	**-**	**2**	**3**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

SEMESTER I

24CAP104B MATHEMATICAL FOUNDATION FOR DATA SCIENCE 4H-4C

Instruction Hours / Week: L:4 T:0 P:0 **Marks:** Internal**:40** External**:60** Total**:100**

End Semester Exam:3Hours

PREREQUISITE:

- Algebra, Probability and Statistics, Programming Skills.

COURSE OBJECTIVES (CO):

- To refresh the statistical knowledge learnt earlier with hands-on practical expertise
- To understand and manipulate data in high-dimensional spaces.
- To model uncertainty, make inferences about populations from samples, and make predictions.

COURSE OUTCOMES (COS):

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

COs	Course Outcomes	Blooms Level
CO1	Refresh the mathematics knowledge with respect to Linear algebra, Vectors, Projections, Principal Component Analysis and Generative Models	Remember
CO2	Refresh the mathematics knowledge with respect to Matrices, Gradient Calculus, Optimization models.	Understand
CO3	Refresh the mathematics knowledge with respect to probability, statistics.	Apply
CO4	Find information about the population on the basis of a random sample taken from that population and also to choose an appropriate test procedure under the test of significance	Evaluate
CO5	Apply mathematical concepts to real-world data science problems.	Apply

UNIT I LINEAR ALGEBRA **10 HOURS**

Systems of Linear Equations - Machine learning motivation - A geometric notion of singularity - Singular vs non-singular matrices - Linear dependence and independence - Matrix row-reduction - Row operations that preserve singularity - The rank of a matrix - Row echelon form - Reduced row echelon form- LU decomposition- Solving Systems of Linear Equations - Machine learning motivation - Solving non- singular systems of linear equations - Solving singular systems of linear equations - Solving systems of equations with more variables - Gaussian elimination.

UNIT II PROBABILITY & STATISTICS **10 HOURS**

Introduction to probability - Concept of probability: repeated random trials - Conditional probability and independence - Random variables - Cumulative distribution function - Discrete random variables: Binomial distribution - Probability mass function - Continuous random variables: Uniform distribution - Continuous random variables: Gaussian distribution -Joint distributions - Marginal and conditional distributions - Independence - covariance - Multivariate normal distribution - Sampling and point estimates - Interval estimation -Confidence intervals – Confidence Interval for mean of population - Biased vs Unbiased estimates-Maximum likelihood estimation - Intuition behind maximum likelihood estimation - Hypothesis

testing - Describing samples: sample proportion and sample mean - Two types of errors - Test for proportion and means - Two sample inference for difference between groups.

UNIT III BAYESIAN STATISTICS & ITS APPLICATIONS IN VARIOUS FIELDS **10 HOURS**

Bayesian statistics and its applications in various fields - Bayesian Learning: Bayes theorem - maximum likelihood and least squared error hypotheses – Naïve Bayes classifier- Bayesian belief networks- gradient ascent training of Bayesian networks- learning the structure of Bayesian networks- the EM algorithm- mixture of models- Markov models- hidden Markov models - Time series analysis and forecasting techniques - Basic Properties of time-series data: Distribution and moments- Stationarity- Autocorrelation- Heteroscedasticity- Normality- Survival Analysis.

UNIT IV NON-PARAMETRIC STATISTICS **9 HOURS**

Non-parametric Statistics - Chi square test- Sign test -Wilcoxon signed rank test - Mann Whitney test - Run test - Kolmogorov Smirnov test - Spearmann and Kendall's test - Tolerance region.

UNIT V MULTIVARIATE STATISTICAL METHODS FOR ANALYZING COMPLEX DATASETS **9 HOURS**

Multivariate statistical methods for analysing complex datasets - Factor Analysis - Cluster Analysis- Regression Analysis - Discriminant Analysis.

TOTAL: 48 HOURS

TEXT BOOKS:

1 Phillips, J. M. (2021). *Mathematical Foundations for Data Analysis*. Springer Series.

2 Hastie, T., Tibshirani, R., & Friedman, J. (2009). *The Elements of Statistical Learning: Data Mining, Inference, and Prediction* (2nd ed.). Springer.

REFERENCE BOOKS:

1 Thompson, S. K. (2012). *Sampling*. John Wiley & Sons.

2 Montgomery, D. C. (2008). *Introduction to Quality Control* (6th ed.). John Wiley & Sons.

WEBSITES:

1 https://ibse.iitm.ac.in/course/math-foundations-of-ds/

2 https://medium.com/illumination/i-found-the-4-mathematical-foundations-that-are-essential-for-data-science-ebe449aa30ce

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	2	2	3	2	-	3	3	-	1	-	-	-	-	3	2
CO2	3	-	1	1	3	2	-	2	3	-	-	-	-	-	-	2	1
CO3	3	-	1	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CO4	3	-	2	-	3	3	-	1	2	-	1	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
Average	**3**	**-**	**1.5**	**1.5**	**3**	**2.3**	**-**	**2**	**2.7**	**-**	**1.5**	**-**	**-**	**-**	**-**	**2.5**	**1.5**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

SEMESTER I

24CAP105PE2 **PROFESSIONAL ELECTIVE - 1** **4H-3C**

Instruction Hours / Week: L:4 T:0 P:0 **Marks:** Internal**:40** External**:60** Total**:100**

End Semester Exam:3Hours

SEMESTER I

24CAP106 **PROFESSIONAL SOFT SKILLS - I** **3H-2C**

Instruction Hours / Week: L:3 T:0 P:0 **Marks:** Internal**:40** External**:60** Total**:100**

End Semester Exam:3Hours

PREREQUISITE:

- Not Required

COURSE OBJECTIVES (CO):

- To improve clarity and conciseness in verbal and written communication.
- To enhance ability to adapt to changing circumstances and new challenges.
- To promote a respectful and supportive workplace environment.

COURSE OUTCOMES (COS):

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

COs	Course Outcomes	Blooms Level
CO1	Understand and implement positive outlook, interpret the body language of team members and stakeholders, better interpersonal relationships. Develop into self-motivated professionals with confidence. Practice Responding instead of Reacting.	Understand
CO2	Create good Presentation and Present with confidence. Also, recognize and manage Stress, Prioritize and Plan.	Create
CO3	Listen to understand. To be able to ask good questions.	Understand
CO4	Understand to be a good Team player, Team Dynamics and to understand the Business Ethics	Apply
CO5	Write and speak correctly, forming grammatically correct sentences.	Apply

UNIT I POSITIVE ATTITUDE **7 HOURS**

Attitude- Campus to Corporate attitude change, Recognizing Negative Attitude, Campus to Corporate attitude change; Attitude at work- Impact of Negative Attitude in the Workplace, Overcoming Negative Attitude, positive attitude, thought process, Building self-confidence and Assertiveness; Toxic positivity; 3Es, Motivation-Intrinsic and Extrinsic Motivation, Inspiration vs motivation; Emotional Intelligence-Intro to EI, Four clusters. Transactional Analysis (TA), SWOT analysis - Professional analysis.

UNIT II: BODY LANGUAGE **7 HOURS**

Importance of Body Language, Five Cs of Body Language, Body language in different cultures, Positive Body Language; Voice Control- Pace. Pause and Pitch; Culture-Inclusivity and Proxemics across Global Cultures, Understanding POSH; Stress Management-What is Stress, Eustress, Reasons of stress (work/ personal); Stress Management Techniques

UNIT III PRESENTATION SKILLS **7 HOURS**

Self-introduction – Exercises, Why Give Presentations; Craft your message-Plan the visuals, Manage the Response; How to create an effective presentation - Virtual & Physical, Do’s & Don'ts of Presentation Skills, Objection handling, Stage Fear – Causes and Cure, Practice the Delivery; Time Management-Common Time & Energy Wasters, Planning & Prioritizing Time Matrix & Analysis

UNIT IV LISTENING & QUESTIONING SKILLS **7 HOURS**

Barriers to effective listening - how to overcome them; Exercises - Customer Call Flow – Role-play, Cust calls amongst the team; How to frame Questions, Different kinds of questions, asking appropriate questions; Spoken English-Introduction to Parts of Speech and its usage; Subject - Verb Agreement; Basic conversation skills-sentence construction -SVO

UNIT V TEAMWORK **8 HOURS**

Teamwork and Ethics - Definition of TEAM - Team vs Groups. Difference b/w Healthy competition and cut throat competition, Importance of working in teams, Evolution of a TEAM, Benefits of team work; Virtual teams- Challenges and ways to overcome it, Diversity and Inclusion in a team; Development of Teams Stages of team development; Team dynamics-its importance & Interpersonal Skills Development Ethics- to enable students to identify and deal with ethical problems, develop their moral intuitions, which are implicit in everyday choices and actions; Conflict Management: Team building Activities- Predetermined/ Predesigned Indoor/ Outdoor activities to build a team, enhance language and inter personal skills

TOTAL: 36 HOURS

TEXT BOOKS:

1 Kumar, S., & PushpLata. (2015). *Communication Skills* (2nd ed.). New Delhi: Oxford University Press.

2 Murphy, R. (2012). *Essential English Grammar: Reference and Practice for South Asian Students* (2nd ed.). Cambridge: Cambridge University Press.

REFERENCE BOOKS:

1 Pye, G. (2011). *Vocabulary in Practice, Parts 1 and 2* (1st ed.). Cambridge: Cambridge University Press.

WEBSITES:

1 https://www.forbes.com/advisor/in/business/soft-skills-examples/

2 https://www.thebalancemoney.com/list-of-soft-skills-2063770

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	1	-	1	1	-	-	-	1	2	-	-	-	-	1	-
CO2	3	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	2
CO3	3	-	2	-	-	-	-	2	2	-	-	-	1	-	-	-	-
CO4	3	-	1	-	-	1	-	2	2	-	-	-	-	-	-	-	-
CO5	3	-	1	1	1	-	-	1	2	-	-	-	1	-	-	-	-
Average	**3**	**-**	**1.2**	**1**	**1**	**1**	**-**	**1.7**	**2**	**1**	**2**	**-**	**1**	**-**	**-**	**1**	**2**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

24CAP111B **DATA SCIENCE - PRACTICAL** **5H-3C**

Instruction Hours / Week: L:0 T:0 P:5 **Marks:** Internal**:40** External**:60** Total**:100**

End Semester Exam:3Hours

PREREQUISITE:

- Probability and Statistics, Programming Skills, Python Libraries, Learning Concepts

COURSE OBJECTIVES (CO):

- To learn techniques for handling missing data, outliers, and data imputation.
- To build a portfolio of projects demonstrating your proficiency and innovation in data science.
- To evaluate model performance using appropriate metrics (e.g., accuracy, precision, recall).

COURSE OUTCOMES (COS):

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

COs	Course Outcomes	Blooms Level
CO1	Achieve proficiency in cleaning and preprocessing diverse datasets, ensuring data integrity and quality.	Apply
CO2	Apply feature engineering techniques to extract relevant features and improve model performance.	Apply
CO3	Generate visualizations and summary statistics that provide meaningful insights into data characteristics.	Understand
CO4	Develop and implement machine learning models for predictive tasks (e.g., regression, classification).	Apply
CO5	Implement advanced machine learning techniques such as ensemble methods (e.g., random forests, gradient boosting) and deep learning for complex data problems.	Apply

LIST OF PROGRAMS (CASE STUDIES) **60 HOURS**

1 Present your view on the different techniques you have employed to do outlier analysis, handling missing data, feature engineering, feature importance and improving the accuracy of the model both from a classifier as well as a regressor. Use any sample data and present your POV in a well-structured presentation.

2 Present your findings on different activation functions you have used and methods to improve the accuracy of the model using neural networks. You should be able to clearly articulate the advantage and disadvantage of each activation function. Use any sample data and present your POV in a well-structured presentation.

3 Present your findings on different techniques of anomaly detection and k means clustering. Use any sample data and present your POV in a well-structured presentation

4 Present your POV on how to generate synthetic data using GANs. You can assume a sample

dataset from an IOT enabled machine where the failure rates are minimal.

5 Present your POV on Style related GANS. Explore the earliest models to the current models. Articulate the successive improvements in the models. Also articulate the future of GANs in generating realistic images.

6 Present your POV on GANs used for Deep Fakes. Articulate how we can identify the Deep Fake from the original.

TOTAL: 60 HOURS

TEXT BOOKS:

1 Fuentes, A. (2018). *Become a Python Data Analyst*. Packt Publishing.

2 Motwani, B. (2020). *Data Analytics using Python*. Wiley.

3 Damji, J. S. (2020). *Learning Spark: Lightning-Fast Data Analytics* (2nd ed.). Shroff/O'Reilly.

REFERENCE BOOKS:

1 Barry, P. (2016). *Head First Python* (2nd ed.). O'Reilly Media.

2 McKinney, W. (2022). *Python for Data Analysis: Data Wrangling with pandas, NumPy, and Jupyter* (3rd ed.). O'Reilly Media.

3 Lambert, K. A. (2019). *Fundamentals of Python – First Programs* (2nd ed.). Cengage Publications.

WEBSITES:

1 http://docs.python.org/3/tutorial/index.html

2 http://interactivepython.org/courselib/static/ pythons

3 http://www.ibiblio.org/g2swap/byteofpython/read/

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	1	-	-	1	-	-	-	1	-	-	-	-	-	3	-
CO2	3	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-
CO3	3	-	2	3	3	2	-	1	3	-	-	-	-	-	-	-	2
CO4	3	-	-	-	1	-	-	-	1	-	-	-	2	2	-	-	-
CO5	3	-	1	2	-	1	-	1	-	-	2	-	-	3	-	-	-
Average	**3**	**-**	**1.3**	**2.5**	**1.7**	**1.3**	**-**	**1**	**1.7**	**1**	**2**	**-**	**2**	**2.5**	**-**	**3**	**2**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

SEMESTER I

24CAP112B APPLIED MACHINE LEARNING - PRACTICAL 4H-3C

Instruction Hours / Week: L:0 T:0 P:4 **Marks:** Internal**:40** External**:60** Total**:100**

End Semester Exam:3Hours

PREREQUISITE:

- Probability and Statistics, Programming Skills, Python Libraries, Learning Concepts

COURSE OBJECTIVES (CO):

- To deploy a machine learning model into a production environment, ensuring it meets performance and scalability requirements.
- To implement automated decision-making processes based on machine learning predictions, reducing reliance on manual interventions.
- To achieve higher accuracy and reliability in predictions compared to baseline or existing methods, validated through rigorous testing and evaluation.

COURSE OUTCOMES (COS):

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

COs	Course Outcomes	Blooms Level
CO1	Practice translating business requirements into well-defined machine learning tasks (e.g., classification, regression, clustering).	Apply
CO2	Handle missing data, outliers, and data normalization effectively to improve model performance.	Analyze
CO3	Implement feature engineering techniques to create informative features from raw data.	Understand
CO4	Evaluate and compare different machine learning algorithms suitable for the problem at hand.	Evaluate
CO5	Engage in continuous learning through projects, online courses, and participation in machine learning communities.	Evaluate

LIST OF PROGRAMS **48 HOURS**

1 Understanding "Mobile Price" dataset by doing feature analysis. Data is available at: https://www.kaggle.com/datasets/iabhishekofficial/mobile-price-classification/data

2 Execute data preprocessing step on the above dataset: perform outlier and missing data analysis towards building a refined dataset

3 Build machine learning model/s to predict the actual price of the new mobile based on other given features like RAM, Internal Memory etc

4 Calculate the prediction accuracy of the models used in Experiment 3 and do comparative analysis among them to identify the best technique.

5 Understanding "Second Hand Car Prediction Price" dataset by doing feature analysis. Data is

available at: https://www.kaggle.com/datasets/sujithmandala/second-hand-car-price-prediction

6 Perform data preprocessing step on the above dataset: perform outlier and missing data analysis towards building a refined dataset.

7 Perform Feature Engineering towards building new feature which is more impactful.
Build machine learning model/s to predict the price of the car based on other given features like Brand, Model, Year, Fuel Type etc

8 Calculate the prediction accuracy of the models used in Experiment 7 and do comparative analysis among them to identify the best technique.

9 Plot the features (actual price and predicted price) in scatter plot to understand the variation.

10 Understanding "Marketing Campaign Positive Response Prediction" dataset by analysing all the features. Data is available at: https://www.kaggle.com/datasets/sujithmandala/marketing-campaign-positive-response-prediction

11 Perform exploratory data analysis on the above dataset: perform outlier and missing data analysis towards building a refined dataset. Show the outliers in box plot or through some statistical technique. Find the numerical and categorial features.

12 Perform Feature Engineering towards building new feature which is more impactful than the existing ones. Build the correlation matrix and show visually the relationship among various features.

13 Build machine learning model/s to predict the result of marketing campaign based on other given features like customer details, gender, annual income etc

14 Calculate the prediction accuracy of the models used in Experiment 13 and do comparative analysis among them to identify the best technique.

15 Please check whether you find imbalanced classes, overfitting, and data bias in the above two datasets. Please apply some technique to overcome it.

TOTAL: 48 HOURS

TEXT BOOKS:

1 Li, H. (2023). *Machine Learning Methods*. Springer Nature Singapore.

2 Rao, R. N. (2022). *Machine Learning in Data Science Using Python*. Dreamtech Press.

REFERENCE BOOKS:

1 Alpaydin, E. (2014). *Introduction to Machine Learning* (3rd ed., Adaptive Computation and Machine Learning Series). MIT Press.

2 Aggarwal, C. C. (2018). *Neural Networks and Deep Learning* (1st Kindle ed.).

WEBSITES:

1 https://ai.google/education/

2 https://machinelearningmastery.com/

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	2	2	2	-	-	-	-	3	-
CO2	3	-	3	3	3	2	-	1	3	-	-	-	-	-	-	-	2
CO3	3	-	3	3	3	2	-	1	3	-	-	-	-	2	-	-	-
CO4	3	-	3	3	3	2	-	1	3	-	-	-	2	-	-	-	1
CO5	3	-	2	2	2	1	1	1	2	-	-	-	-	-	-	-	-
Average	**3**	**-**	**2.8**	**2.8**	**2.8**	**1.8**	**1**	**1**	**2.6**	**2**	**2**	**-**	**2**	**2**	**-**	**3**	**1.5**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

SEMESTER I

JOURNAL PAPER ANALYSIS & PRESENTATION **2H-0C**

Instruction Hours / Week: L:2 T:0 P:0 **Marks:** Internal**:00** External**:00** Total**:000**

End Semester Exam: 3 Hours

24CAP201A **ADVANCED JAVA PROGRAMMING** **5H-4C**

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To understand multithreading concepts, synchronization mechanisms, thread pools, and concurrent collections in Java.
- To use JDBC (Java Database Connectivity) for database interaction, including advanced topics like connection pooling, transaction management, and batch processing.
- To understand Java security mechanisms, encryption, authentication, and authorization techniques to secure Java applications.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Explain the object oriented programming concepts for solving simple logics.	Understand
CO2	Demonstrate reusable classes using inheritance, packages and interfaces	Understand
CO3	Analyze the concepts of Multithreading, Exception handling and Collection Frameworks to develop efficient and error free codes.	Analyze
CO4	Construct Server side java applications using Servlet and JSP concepts.	Apply
CO5	Develop an application with database connectivity using JDBC and hibernate	Create

UNIT I BASICS OF JAVA, CLASSES AND OBJECTS **12 HOURS**

The Java Buzzwords – Overview of Java – Data Types, Variables and Arrays – Operators – Control Statements – Introducing Classes – Methods and Classes: Overloading Methods– Passing and returning Objects – Recursion – Access control – static – final – Nested and Inner classes.

UNIT II INHERITANCE, PACKAGES AND INTERFACES **12 HOURS**

Inheritance: Basics – Using super – Method Overriding – Dynamic Method dispatch – Abstract classes – final with Inheritance. Packages and Interfaces : Packages – Packages and Member Access – importing Packages – Interfaces – Default Interface Methods – static Methods in Interface - Private Interface methods

UNIT III EXCEPTION HANDLING, MULTITHREADING AND COLLECTION FRAMEWORKS **12 HOURS**

Fundamentals – Types – Uncaught Exceptions – try and catch – Multiple catch – Nested try – throw – throws – finally – Built-in Exceptions – Multithreaded: Java Thread Model – Main Thread – Creating a Thread and Multiple threads – is Alive() and join() - Collection Frameworks: Collection Interfaces - Collection Classes: ArrayList - LinkedList – HashSet - TreeSet - PriorityQueue - Iterator - Map: Map Interfaces - Map Classes: HashMap – TreeMap - Comparators.

UNIT IV SERVLETS AND JAVA SERVER PAGES **12 HOURS**

Working with Servlets: Features – Servlet API – Servlet Life Cycle – Creating a Sample Servlet - Java Server Pages: Architecture of JSP pages – Life Cycle of JSP – Working with JSP Basic Tags and implicit objects – Exploring Action Tags

UNIT V JDBC, HIBERNATE AND SPRING **12 HOURS**

Working with JDBC: Introduction - JDBC Drivers – Features of JDBC – JDBC API – Major Classes and Interfaces – Process with java.sql package – Working with Hibernate: Architecture – Downloading hibernate - Exploring HQL – Hibernate O/R mapping – Working with Hibernate. Introduction to Spring: Overview – Dependency Injection – Spring Libraries – Spring Tool Suite – Developing a simple Spring Application – RESTful Applications.

TOTAL: 60 HOURS

TEXT BOOKS:

1. Herbert Schild, (2021). *Java: The Complete Reference*, 12th Edition, McGraw Hill.
2. CDAC, (2018). *Core and Advanced Java - Black Book*, 1st Edition, Dreamtech Press.
3. Cay Horstmann, (2021). *Core Java -Volume 1: Fundamentals*, 12th Edition , Oracle Press.

WEBSITE LINKS:

1. http://www.codejava.net/java-se/jdbc/connect-to-oracle-database-via-jdbc
2. https://freevideolectures.com/course/3616/java-j2ee-and-soa

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	3	2	3	2	2	1	2	-	1	-	-	-	-	2	-
CO4	3	-	1	1	1	1	1	-	1	-	-	-	-	-	-	-	1
CO5	3	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-
Average	**3**	**-**	**2**	**1.3**	**2**	**1.5**	**1.5**	**1**	**1.5**	**1**	**1**	**-**	**-**	**-**	**-**	**2**	**1**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

24CAP202A **ADVANCED DATABASE TECHNOLOGY** **5H-4C**

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To explore advanced database models beyond relational databases, such as NoSQL databases
- To explore concepts and architectures of distributed databases, replication, fragmentation, transparency, and distributed transaction management.
- To study advanced topics in database security, authentication, authorization, encryption techniques, privacy-preserving techniques, and compliance

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Explain the database along with various Data models	Understand
CO2	Analyze the ways to work with combined table using relational model and algebra.	Analyze
CO3	Analyze different normalization techniques and organize the order of storing data.	Analyze
CO4	Summarize the transaction processing and concurrency control concepts.	Understand
CO5	Explain about distributed databases, multimedia databases	Understand

UNIT I DATA MODELS **12 HOURS**

Introduction – Database System Applications – Purpose of database systems – View of data – Database Languages – Relational Databases – Database Design – Data Storage and Querying – Transaction Management – Database Architecture – Database Users and administrators – Relational Model – Structure of Relational Databases – Database Schema – Keys – Schema Diagrams – Relational Query Languages – Relational Operations- Database Design and E-R model : E-R model- Constraints – ER diagrams – Reduction to Relational Schema – ER design issues.

UNIT II QUERY EVALUATION AND RELATIONAL QUERY LANGUAGE **12 HOURS**

Overview – SQL data definition – Basic structure – Operations – Aggregate Functions –Nested Sub queries – Modification of the database – Intermediate SQL : Joins – views- Integrity Constraints– SQL data types and schemas – Authorization – Formal Relational Query Languages - Relational Algebra.

UNIT III NORMALIZATION, INDEXING AND QUERY PROCESSING 12 HOURS

Relational Database Design: Features of good relational designs- atomic domains and first normal form- functional dependency theory – Decomposition using functional dependencies: 2NF, 3NF, BCNF – Decomposition using Multivalued Dependencies- 4NF, 5NFIndexing – Types of Indices - Query Processing: Overview – Measures of Query Cost -Query optimization – Overview – Transformation of Relational Expressions – Choice of Evaluation Plan.

UNIT IV TRANSACTION PROCESSING AND MANAGEMENT 12 HOURS

Transaction Concept – Properties - Transaction States – Serializability – Lock-Based Protocols- Multiple Granularity – Timestamp Based Protocols – Validation-Based Protocols – Recovery System – Failure Classification – Storage – Recovery and Atomicity.

UNIT V DISTRIBUTED AND ADVANCED DATABASE MODELS 12 HOURS

Distributed Database - Types of Distributed Database Systems- Distributed Database Architectures - Enhanced Data Models for Advanced Applications - Active Database Concepts and Triggers - Temporal Database -Spatial Databases - Multimedia Database.

TOTAL: 60 HOURS

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth and Sudharshan S, (2019). *Database System Concepts*, 7th Edition, Tata McGraw Hill, New York.
2. RamezElmasri, Shamkant B. Navathe, (2017). *Fundamentals of Database Systems*, 7th Edition, Pearson.

REFERENCE BOOKS:

1. Lee Chao, (2010). *Database Development and Management*, Auerbach Publications.

WEBSITE LINKS:

1. https://www.studocu.com/in/course/anna-university/advanced-database- technologies/4339112
2. https://www.javatpoint.com/dbms-tutorial
3. https://www.geeksforgeeks.org/dbms/
4. https://www.tutorialspoint.com/dbms/index.html

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	-	-	-	1	-	-	2	1	-	-	-	-	-	2	-
CO2	3	-	2	1	3	2	-	2	3	-	2	-	-	-	-	-	2
CO3	3	-	2	1	3	2	-	2	3	-	2	-	-	-	-	-	3
CO4	3	-	-	-	-	1	-	-	2	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	1	-	-	2	-	-	-	-	-	-	-	-
Average	**3**	**-**	**2**	**1**	**3**	**1.4**	**-**	**2**	**2.4**	**1**	**2**	**-**	**-**	**-**	**-**	**2**	**2.5**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

24CAP203A **CYBER SECURITY** **4H-3C**

Instruction Hours / Week: L: 4 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To systematically educate the necessity to understand the impact of cyber-crimes and threats with solutions in a global and societal context.
- To select suitable ethical principles and commit to professional responsibilities and human values and contribute value and wealth for the benefit of the society
- To learn about Risk assessment, plan suitable security controls, audit and compliance.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Outline the principles of cyber security and to identify threats and risks	Understand
CO2	Explain how to secure physical assets and develop system security controls.	Understand
CO3	Explain how to apply security for Business applications and Network Communications.	Understand
CO4	Summarize the technical means to achieve security.	Understand
CO5	Explain monitor and audit security measures.	Understand

UNIT I PLANNING FOR CYBER SECURITY **10 HOURS**

Best Practices-Standards and a plan of Action-Security Governance Principles, components and Approach- Information Risk Management-Asset Identification-Threat Identification-Vulnerability Identification-Risk Assessment Approaches-Likelihood and Impact Assessment-Risk Determination, Evaluation and Treatment- Security Management Function-Security Policy-Acceptable Use Policy- Security Management Best Practices – Security Models: Bell La Padula model, Biba Integrity Model - Chinese Wall model.

UNIT II SECURITY CONTROLS **10 HOURS**

People Management-Human Resource Security-Security Awareness and Education-Information Management- Information Classification and handling-Privacy-Documents and Record Management-

Physical Asset Management-Office Equipment-Industrial Control Systems-Mobile Device Security-System Development-Incorporating Security into SDLC - Disaster management and Incident.

UNIT III – CYBER SECURITY FOR BUSINESS APPLICATIONS NETWORKS 10 HOURS

Business Application Management-Corporate Business Application Security-End user Developed Applications-System Access- Authentication Mechanisms-Access Control-System Management- Virtual Servers-Network Storage Systems-Network Management Concepts-Firewall-IP Security- Electronic Communications – Case study on OWASP vulnerabilities using OWASP ZAP tool.

UNIT IV TECHNICAL SECURITY 9 HOURS

Supply Chain Management-Cloud Security-Security Architecture-Malware Protection-Intrusion Detection-Digital Rights Management-Cryptographic Techniques-Threat and Incident Management-Vulnerability Management - Security Event Management - Forensic Investigations- Local Environment Management-Business Continuity.

UNIT V SECURITY ASSESSMENT 9 HOURS

Security Monitoring and Improvement-Security Audit-Security Performance-Information Risk Reporting - Information Security Compliance Monitoring-Security Monitoring and Improvement Best Practices – Cyber laws.

TOTAL: 48 HOURS

TEXT BOOKS:

1. William Stallings, 2019. Effective Cyber Security - A guide to using Best Practices and Standards, Addison-Wesley Professional, First Edition.
2. Adam Shostack, 2014. Threat Modelling - Designing for Security, Wiley Publications, First Edition.
3. Gregory J. Touhill and C. Joseph Touhill, 2014. Cyber Security for Executives - A Practical Guide, Wiley Publications, First Edition.
4. Raef Meeuwisse, 2017. Cyber Security for Beginners, Second Edition, Cyber Simplicity Ltd, 2017.

REFERENCE BOOKS

1. Patrick Engebretson, 2013. The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy, 2nd Edition, Syngress.
2. Charles P. Pfleeger, Shari Lawrence Pfleeger, Jonathan Margulies, 2015. Security in Computing", Fifth Edition, Prentice Hall.

WEBSITE LINKS

1. https://esu.desire2learn.com/
2. https://www.javatpoint.com/what-is-cyber-security
3. https://www.techtarget.com/searchsecurity/definition/cybersecurity

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	1	-	1	1	-	-	-	1	2	-	-	-	-	1	-
CO2	3	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	2
CO3	3	-	2	-	-	-	-	2	2	-	-	-	1	-	-	-	-
CO4	3	-	1	-	-	1	-	2	2	-	-	-	-	-	-	-	-
CO5	3	-	1	1	1	-	-	1	2	-	-	-	1	-	-	-	-
Average	**3**	**-**	**1.2**	**0.2**	**0.4**	**0.4**	**-**	**1**	**1.2**	**-**	**0.4**	**-**	**-**	**-**	**-**	**0.2**	**0.4**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester I

24CAP204* **PROFESSIONAL ELECTIVE - II** **5H-3C**

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

Semester I

24CAP205* **PROFESSIONAL ELECTIVE - III** **5H-3C**

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

24CAP211A ADVANCED JAVA PROGRAMMING -PRACTICAL 4H-2C

Instruction Hours / Week: L: 0 T: 0 P: 4 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To develop a custom container that encapsulates related classes and interfaces.
- To implement linked list data structure using the LinkedList collection class.
- To implement Dependency Injection (DI) and Inversion of Control (IoC) concepts.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Construct object oriented programming concepts for solving simple logics	Apply
CO2	Construct reusable classes using inheritance, packages and interfaces	Create
CO3	Apply the concepts of Multithreading, Exception handling and Collection Frameworks to develop efficient and error free codes.	Apply
CO4	Develop Server side java applications using Servlet and JSP concepts	Create
CO5	Construct simple applications to best interact with relational database systems using JDBC and hibernate	Create

List of Programs **48 HOURS**

1. Design a Class which consists of instance variables and methods. Create an object for the class to access all the members of the class and create more than one objects and store the reference of all objects in a single variable.
2. Construct a class with more than one method having same name but with different signature. Also test the static methods with same name, with different input parameters.
3. Design a java class which acquire the properties of the parent class and also design a subclass which provides the specific implementation of the method that has been declared by one of its parent classes and create an object which should bound its functionality at runtime. Design another class that implements two or more interfaces and all the implemented interfaces contain default methods with the same name and signature.
4. Develop an application with a custom-container that should bundle related types like classes and interfaces into a single group with proper access protection and namespace management.

5. Design error events in java that occurs during the execution of a program and disrupts the normal execution of the program's code.
6. Write a java program with Light-weight sub-processes that should be executed concurrently to maximize the utilization of CPU.
7. Design a dynamic array using collection class Array List and implement the Linked list data structure using LinkedList collection class.
8. Implement a Java Servlet Program to implement a dynamic HTML using Servlet and JSP.
9. Design a java application that should establish the connection from Java Client to any relational database systems using JDBC API and Hibernate.
10. Create a simple application using Spring Framework
11. Design an employee payroll management system with basic modules and its processes as

    Admin:

    Admin can Add/Edit/delete the employees.

    Admin can Add/Edit/delete the schedule the work of the employees.

    Admin can Add and calculate/Edit/Delete the Salary of the employee.

    Employee:

    Employees can view his/her schedule set by Admin.

    Employees can check his/her attendance.

    Employees can update his/her details.

    Employees can View their salary details

12. Design an Electricity bill management system with basic modules and its processes as follows

    Login registration:

    Admin(Electricity board user), and User(Customer) can log in and register in the application.

    Admin can add a new user in the application as well as a new customer also can log in by itself by using its consumer number.

    Billing:

    Admin can add details about the consumer details according to the consumed electricity units consumed by the consumer. Users can view the bill

TOTAL: 48 HOURS

TEXT BOOKS:

1. Herbert Schild, (2021). *Java: The Complete Reference*, 12th Edition, McGraw Hill.
2. CDAC, (2018). *Core and Advanced Java - Black Book*, 1st Edition, Dreamtech Press.

REFERENCE BOOKS:

1. Cay Horstmann, (2021). *Core Java -Volume 1: Fundamentals*, 12th Edition, Oracle Press.

WEBSITE LINKS:

1. http://www.codejava.net/java-se/jdbc/connect-to-oracle-database-via-jdbc
2. https://freevideolectures.com/course/3616/java-j2ee-and-soa
3. https://www.javatpoint.com/java-programs
4. https://www.tutorialspoint.com/java/index.htm

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	-	3	1	1	-	1	1	-	1	-	-	-	-	-	-
CO2	3	-	2	2	2	2	-	2	2	-	-	-	-	-	-	3	-
CO3	3	-	2	2	2	2	-	2	3	-	-	-	-	-	-	-	2
CO4	3	-	3	3	3	3	-	3	3	-	-	-	-	-	-	-	2
CO5	3	-	2	2	2	2	-	2	2	-	-	-	-	-	-	-	-
Average	**3**	**-**	**2.3**	**2.4**	**2**	**2**	**-**	**2**	**2.2**	**-**	**1**	**-**	**-**	**-**	**-**	**3**	**2**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

24CAP212A ADVANCED DATABASE TECHNOLOGY -PRACTICAL 4H-2C

Instruction Hours / Week: L: 0 T: 0 P: 4 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To explore transaction management techniques to handle database concurrency and ensure ACID properties.
- To utilize aggregate functions (AVG, COUNT, MAX, MIN, SUM) for data analysis and reporting in the Employee database.
- To implement set operations (UNION, UNION ALL, INTERSECT, MINUS) to manipulate and retrieve data from multiple queries.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Implement the various DML, DCL, DDL Queries.	Create
CO2	Build the essential DB objects.	Create
CO3	Apply aggregate functions and set operations.	Apply
CO4	Solve Implicit, Explicit Cursor Operations for the table	Apply
CO5	Implement triggers with various constraints.	Create

List of Programs **48 HOURS**

1. Consider a University Database and use necessary schema (Student, Department, Faculty, Courses...etc), Make use of DDL operations to perform creation of table, alter, modify, drop and truncate. Additionally apply DML transactions over the schema and use appropriate Integrity constraints like Primary Key, Unique key, Foreign Key, Check, Default, Null and Not Null.
2. Construct the University database and schema to perform the controlling privileges operations with TCL –Commit, Save point and Rollback the transactions. To deal with the rights, permissions, and other controls of the database system use DCL that includes commands such as GRANT and REVOKE.
3. Build the essential DB objects using view, sequences ,indexes and synonyms for University Database
4. Make use of Employee Database and perform SQL Statements on
    a. Single row: General functions, Case Conversion functions, Character functions, Date functions, Number functions.

b. Aggregate functions: AVG, COUNT, MAX, MIN, SUM.

c. Set operations :Union, UnionAll, Intersect, Minus.

5. Experiment with Employee Database and Perform various Joins & Sub queries for displaying data from multiple tables using SQL operators, GROUPBY, HAVING and ORDERBY clause
6. Construct a basic block to combine database language and procedural programming language using PL/SQL programs
7. Generate a payroll process for employee tables by stored functions and stored procedures using PL/SQL programs
8. Iterate n number of employees using Cursors in PL/SQL programs and perform Implicit, Explicit Cursor Operations for the table.
9. Create Triggers for DML Statement, DDL Statement, System and User event. Make Use of PL/SQL block to cal lmultiple functions, procedures, cursors using package.
10. Write PL/SQL programs to Handle Exceptions with inbuilt libraries and customized way to raise an exceptions.

TOTAL: 48 HOURS

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth and Sudharshan S, (2019). *Database System Concepts*, 7th Edition, Tata McGraw Hill, New York.
2. RamezElmasri, Shamkant B. Navathe, (2017). *Fundamentals of Database Systems*, 7th Edition, Pearson.

REFERENCE BOOKS:

1. Lee Chao, (2010). *Database Development and Management*, Auerbach Publications.

WEBSITE LINKS

1. https://www.studocu.com/in/course/anna-university/advanced-database- technologies/4339112
2. https://www.javatpoint.com/dbms-tutorial
3. https://www.tutorialspoint.com/dbms/index.html

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	3	3	1	1	-	-	2	-	1	-	-	-	-	3	2
CO2	3	-	3	3	2	2	-	2	2	-	-	-	-	-	-	2	1
CO3	3	-	3	2	2	2	-	1	3	-	-	-	-	-	-	3	3
CO4	3	-	3	3	3	3	-	1	2	-	-	-	-	-	-	-	-
CO5	3	-	3	3	1	1	-	1	2	-	1	-	-	-	-	3	3
Average	**3**	**-**	**3**	**2.8**	**1.8**	**1.8**	**-**	**1.3**	**2.2**	**-**	**1**	**-**	**-**	**-**	**-**	**2.8**	**2.3**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester II

24CAP206 **COMMUNITY ENGAGEMENT & SOCIAL RESPONSIBILITY** **2H-2C**

Instruction Hours / Week: L: 2 T: 0 P: 0 **Marks:** Internal**: 100** External**: 00** Total**: 100**

End Semester Exam:3 Hours

PRE-REQUISITE:

- Not required

COURSE OBJECTIVES (CO):

- To gain insights into the structures, challenges, and opportunities within communities
- To explore ethical frameworks and dilemmas related to community engagement and social responsibility
- To develop skills in monitoring, evaluating, and reporting on the outcomes of community engagement efforts to ensure effectiveness and accountability.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Understand the concept, ethics, and spectrum of community engagement	Understand
CO2	Recognize the significance in local community development and rural culture.	Understand
CO3	Know the rural development programs, institutions	Understand
CO4	Analyze the role of local administration in fostering community involvement and social networking.	Analyze
CO5	Develop skills in conducting community engaged research with a focus on ethics, rural distress, poverty alleviation, and disaster mitigation.	Apply

UNIT I INTRODUCTION AND PRINCIPLES **5 HOURS**

Concept, Ethics and Spectrum of Community engagement, Local community, Rural culture and Practice of community engagement - Stages, Components and Principles of community development, Utility of public resources. Contributions of self-help groups

UNIT II RURAL DEVELOPMENT **5 HOURS**

Rural Development Programs and Rural institutions Local Administration and Community Involvement-Social contribution of community networking, Various government schemes. Programmes of community engagement and their evaluation.

UNIT III COMMUNITY AND RESEARCH **5 HOURS**

Community Engaged Research and Ethics in Community Engaged Research Rural Distress, Rural Poverty, Impact of COVID-19 on Migrant Laborers, Mitigation of Disaster.

UNIT IV RURAL INSTITUTIONS AND MICRO GOVERNANCE SYSTEM **5 HOURS**

Traditional rural organisations, Self-help Groups, women empowerment initiatives, youth in governance, Local governance, Panchayati raj institutions (Gram Sabha, Gram Panchayat, Standing Committees), local civil society, local administration

4 HOURS

UNIT V GOVERNMENT PROGRAMS FOR RURAL DEVELOPMENT

History of rural development in India, current national programmes: Sarva Shiksha Abhiyan, Beti Bachao, Beti Padhao, Ayushman Bharat, Swachh Bharat, PM Awaas Yojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA, etc., national programs in SouthEast Asia-lessons learnt from India

TOTAL: 24 HOURS

TEXT BOOK:

1. Principles of Community Engagement, (2011).2nd Edition, NIH Publication No. 11-7782.

WEBSITES:

1. https://youtu.be/-SQK9RGBt7o
2. https://www.uvm.edu/sites/default/files/community_engagement_handout.pdf (Community Engagement)
3. https://www.atsdr.cdc.gov/communityengagement/pce_concepts.html (Perspectives of Community)
4. https://egyankosh.ac.in/bitstream/123456789/59002/1/Unit1.pdf (community concepts)
5. https://sustainingcommunity.wordpress.com/2013/07/09/ethics-and-community-engagement/(Ethics of community engagement)
6. https://www.preservearticles.com/sociology/what-are-the-essential-elements-of-community/4558 (Elements of Community)
7. https://www.yourarticlelibrary.com/sociology/rural-sociology/rural-community-top-10-characteristics-of-the-rural-community-explained/34968 (features of rural community)
8. https://www.mapsofindia.com/my-india/government/schemes-for-rural-development-launched-by-government-of-india (Government programmes for rural development)
9. https://www.yourarticlelibrary.com/sociology/rural-sociology/rural-community-top-10-characteristics-of-the-rural-community-explained/34968 (rural lifestyle)
10. https://www.insightsonindia.com/social-justice/issues-related-to-rural-development/government-schemes-for-rural-development-in-india/ (schemes for rural development)
11. https://www.mpgkpdf.com/2021/09/community-development-plan-in-hindi.html?m=1
12. https://images.app.goo.gl/sNF2HMWCuCfkqYz56
13. https://images.app.goo.gl/VaMNNMEs77XyPMrP7

CO, PO, PSO Mapping

CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	3	3	-	-	3	-	-	-	-	-	-	-	-	-	2	-	-
CO2	3	2	-	-	3	-	2	1	-	2	-	-	-	-	-	-	1
CO3	3	-	2	3	-	2	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	2	-	-	2	-	1	-	3	-	-	-	-	2	-	1
CO5	3	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	**3**	**2.5**	**2**	**2**	**3**	**2**	**2**	**1**	**-**	**2.5**	**-**	**-**	**-**	**-**	**2**	**-**	**1**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester II

JOURNAL PAPER ANALYSIS & PRESENTATION **1H-0C**

Instruction Hours / Week: L:1 T:0 P:0 **Marks:** Internal**:00** External**:00** Total**:000**

Semester II

24CAP201B **ARTIFICIAL INTELLIGENCE DL** **4H-4C**

Instruction Hours / Week: L:4 T:0 P:0 **Marks:** Internal**:40** External**:60** Total**:100**

End Semester Exam:3Hours

PREREQUISITE:

- Probability and Statistics, Machine Learning Concepts

COURSE OBJECTIVES (CO):

- To Identify and define complex problems that can benefit from deep learning solutions, such as image recognition, natural language processing, or sequential data analysis.
- To Gather and preprocess large-scale datasets suitable for deep learning tasks.
- To Validate models using appropriate metrics and techniques (e.g., cross-validation, holdout validation) to ensure generalizability and reliability.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Understand the fundamental concepts of neural networks, including architectures, training algorithms, and optimization techniques.	Understand
CO2	Understand deep learning techniques such as convolutional neural networks (CNNs), recurrent neural networks (RNNs)	Understand
CO3	Understand generative models such as generative adversarial networks (GANs), variational autoencoders (VAEs), and transformers.	Understand
CO4	Understand principles and strategies for prompt engineering, including designing effective prompts, controlling model behavior, and mitigating biases.	Understand
CO5	Achieve state-of-the-art or competitive performance on benchmark datasets or real-world problems.	Analyze

UNIT I INTRODUCTION TO DEEP LEARNING **12 HOURS**

Introduction to Neural Networks + Deep Learning - Basics of Artificial Neuron - Architecture of Neural networks - Forward Propagation - Backpropagation and Optimization - Loss Functions - Regularization Techniques - Training Deep Neural networks - Lab : Practical implementation of training DNN - Neural Networks in Computer Vision - NLP with Neural Networks - Audio and Speech Processing - Reinforcement Learning with Neural networks - Financial Predictions - Healthcare and Medical Imaging - Anomaly Detection in Industry - Linear Algebra for Neural Networks - Calculus and Statistics in Neural networks - Probability and Statistics - Optimization Techniques - Discrete Mathematics - Advanced Mathematical Concepts - Introduction to Tensor Flow - Lab : Building models with

TensorFlow - Introduction to PyTorch - Lab : Building models with PyTorch - Introduction to Keras - Comparative study of Deep Learning Frameworks.

UNIT II CONVOLUTIONAL NEURAL NETWORKS **12 HOURS**

Introduction to Convolutional Layers - Pooling Layers - Activation Functions in CNNs - CNN Architecture - Overfitting and generalization in CNNs - Practical Applications of CNN - Early CNN Models - AlexNet and the Breakthrough of CNNs - VGGNet: Simplification and Depth - GoogleNet - ResNet (residual Learning) - Advanced architectures and trends - Setting up the development environment - Data processing for CNNs - Lab : Building CNN models - Training and fine-tuning CNNs - Evaluation and Optimization of CNNs - Deploying CNN models - Understanding Gradient descent - Advanced Optimizers - Regularization Techniques - Hyperparameter Tuning - Learning Rate Schedules - Momentum and adaptive learning techniques - CNNs in Medical image Analysis - Autonomous Vehicles and Robotics - Video Analysis and Event Detection - Augmented and Virtual reality - Advanced Object detection and Image Segmentation - CNNs for Natural Disaster and Climate Analysis.

UNIT III RECURRENT NEURAL NETWORKS **12 HOURS**

Fundamentals of RNNs - Challenges in Training RNNs - Applications of Basic RNN - Types of RNN Architecture - Introduction to Long Short-Term Memory Networks - Long Short-Term Memory Networks (LSTM) - Gated recurrent Units (GRUs) - Bidirectional RNNs - Attention Mechanisms in RNNs - Advanced Applications of RNN Variants - Development Environment Setup for RNNs - Lab : Building and Training Basic RNNs - Lab : Implementing LSTM and GRUs - Optimization and regularization of RNNs - Advanced techniques in RNN Architecture - Deploying RNN Models - Diagnosing RNN Performance Issues - Advanced Gradient techniques - Hyperparameter Tuning for RNNs - Regularization Strategies for RNNs - Troubleshooting deployment issues - Ensuring model robustness and scalability - Text generation and Natural Language Processing - Financial Time Series Predictions - Health Monitoring and Medical Diagnosis - Speech Recognition and Voice Activated Systems - Video Content Analysis and Surveillance.

UNIT IV : IMPROVING DL NETWORKS **12 HOURS**

Bias & Variance – Regularization- Overfitting – Dropout regularization – data augmentation – Normalizing inputs – exploding gradients – derivative computation – gradient checking – gradient descent – exponentially weighted average– optimization algorithms – hyperparameter and its tuning – batch normalization- multiclass classification – DL framework

UNIT V MACHINE LEARNING PROJECTS **12 HOURS**

ML strategy, Orthogonalization - Metrics and classifications - distributors - data sets - Bias and variance - Human level performance - Model performance - error analysis - Training and testing - mismatched data distributions - Transfer learning - multi-task learning - end-to-end deep learning

TOTAL: 60 HOURS

TEXT BOOKS:

1 Charu C. Aggarwal - Neural Networks and Deep Learning, By Springer International Publishing AG (2023)

2 J Lavika Goel, Artificial Intelligence: Concepts and Applications – By Wiley (2021).

REFERENCE BOOKS:

1 Verdhan, V. (2021). *Computer Vision Using Deep Learning Neural Network Architectures with Python and Keras*. Apress.

2 Davies, E. R. (2012). *Computer & Machine Vision* (4th ed.). Academic Press.

3 Szeliski, R. (2011). *Computer Vision: Algorithms and Applications*. Springer Verlag London Limited.

WEBSITES:

1 https://builtin.com/artificial-intelligence/deep-learning-applications

2 https://www.mygreatlearning.com/blog/deep-learning-applications/

3 https://www.knowledgehut.com/blog/data-science/deep-learning-applications

CO,PO,PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	2	3	-	-	-	-	2	-	-	-	-	-	-	-	-
CO2	3	-	2	3	-	-	-	-	2	-	-	-	-	-	-	-	2
CO3	3	-	3	3	3	1	-	1	-	-	-	-	-	-	-	-	-
CO4	3	-	2	3	2	-	-	-	1	-	-	-	-	-	-	-	-
CO5	3	-	3	3	1	1	-	-	-	-	-	-	-	-	-	2	-
Average	3	0	2.4	3	2	1	0	1	1.7	0	0	0	0	0	0	2	2

1-Low, 2-Medium, 3-Strong; '-' - No Correlation

24CAP202B GENERATIVE AI WITH LARGE LANGUAGE MODELS 4H-3C

Instruction Hours / Week: L:4 T:0 P:0 **Marks:** Internal**:40** External**:60** Total**:100**

End Semester Exam:3Hours

PREREQUISITE:

- Automata Theory Concepts, Compiler Design Basics

COURSE OBJECTIVES (CO):

- To Integrate generative AI with other modalities such as images, audio, or video to create To multimodal outputs.
- To Explore cross-modal generation tasks such as image captioning or audio-to-text synthesis.
- To Utilize generative AI to personalize content recommendations or user interfaces based on individual preferences and behaviors.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Understand Fundamentals of Fine Tuning, Types of fine-tuning Techniques.	Understand
CO2	Reinforcement learning and LLM-powered applications.	Apply
CO3	Improve efficiency and scalability in producing large volumes of high-quality content.	Create
CO4	Implement generative AI for tasks such as language translation, summarization, or paraphrasing.	Analyze
CO5	Provide seamless interactions and maintain context over extended conversations.	Apply

UNIT I INTRODUCTION TO GENERATIVE AI **10 HOURS**

Introduction Generative AI & LLMs - LLM use cases and tasks - Text generation before transformers - Transformers architecture - Generating text with transformers - Prompting and prompt engineering (CoT) – RAG Technique for retrival .

UNIT II Generative AI **10 HOURS**

Generative configuration - Generative AI project lifecycle - Pre-training large language models - Computational challenges of training LLMs.

UNIT III FINE TUNING AND EVALUATION **10 HOURS**

Instruction fine-tuning - Fine-tuning on a single task - multi-task instruction fine-tuning - Model evaluation – Benchmarks -Parameter efficient fine-tuning (PEFT) -PEFT techniques 1: LoRA - PEFT techniques 2: Soft prompts.

UNIT IV REINFORCEMENT LEARNING **9 HOURS**

Aligning models with human values - Reinforcement learning from human feedback (RLHF) - RLHF: Obtaining feedback from humans - Reward model - Fine-tuning with reinforcement learning - Model optimizations for deployment.

UNIT V LLM-POWERED APPLICATIONS **9 HOURS**

Generative AI Project Lifecycle - Using the LLM in applications - Interacting with external applications - Helping LLMs reason and plan with chain-of-thought - Program-aided language models (PAL) - ReAct: Combining reasoning and action - LLM application architectures.

TOTAL: 48 HOURS

TEXT BOOKS:

1 Deforest, E. R. (2024). *Prompt Engineering with Transformers and LLM*. Kindle.

2 Rehmani, A. (2024). *Generative AI for Everyone* (1st ed.). Altaf Rehmani.

REFERENCE BOOKS:

1 Foster, D. (2024). *Generative Deep Learning: Teaching Machines to Paint, Write, Compose, and Play*.

2 Gupta, D., & Srivastava, A. (2024). *The Potential of Generative AI: Transforming Technology, Business, and Art through Innovative AI Applications*.

WEBSITES:

1 https://www.techtarget.com/searchenterpriseai/definition/generative-AI

2 https://ai.google/discover/generativeai/

3 https://generativeai.net/

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-
CO2	3	-	3	2	3	1	-	1	2	1	-	-	-	-	-	1	-
CO3	3	-	3	-	3	1	-	1	2	1	-	-	-	-	-	-	-
CO4	3	-	3	1	3	1	-	1	2	1	1	-	-	-	-	-	-
CO5	3	-	1	-	-	-	-	-	2	-	-	-	-	-	-	-	1
Average	**3**	**0**	**2.5**	**1.5**	**3**	**1**	**0**	**1**	**1.8**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**1**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

COURSE TO BE LEARNT THROUGH NPTEL / SWAYAM/ SWAYAM PLUS

24CAP203B **PROFESSIONAL SOFT SKILLS - II** **3H-2C**

Instruction Hours / Week: L:3 T:0 P:0 **Marks:** Internal**:40** External**:60** Total**:100**

End Semester Exam:3Hours

PREREQUISITE:

- Not Required

COURSE OBJECTIVES (CO):

- Improve clarity and conciseness in verbal and written communication.
- Enhance ability to adapt to changing circumstances and new challenges.
- Promote a respectful and supportive workplace environment.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Understand what is spoken without distortion and respond appropriately.	Understand
CO2	Behave professionally.	Apply
CO3	Participate productively in an official meeting keeping etiquette in mind.	Understand
CO4	Communicate effectively through writing.	Apply
CO5	Behave appropriately in an official environment.	Analyze

UNIT I ACCENT NEUTRALIZATION **7 HOURS**

Identifying and dealing with Mother Tongue Influence (MTI) – Pronunciation - Vowel Sounds and Consonant Sounds – Inflection – Pausing - Reducing rate of speech - Volume and tone – Pitch – Clarity - and enunciation.

UNIT II CUSTOMER SERVICE **7 HOURS**

Customer Service - Different types of customers - Difference between customer service and customer experience - Telephone Etiquette - Handling difficult customers.

UNIT III PROBLEM SOLVING AND DECISION MAKING **7 HOURS**

Define a Problem - Define Decision Making- Blocks in problem solving - Stereotyping and unconscious biases - The process of Problem Solving and decision making - Problem Analysis- Decision Analysis - Potential Problem / Opportunity Analysis - Creative Thinking - Problem Solving process - Implementation of the solution.

UNIT IV BUSINESS EMAIL ETIQUETTE AND CHAT **7 HOURS**

Emails Etiquette: Share format/ signature - Emails etiquette - dos and don’ts.

UNIT V BASICS OF FINANCE **7 HOURS**

Accounting systems and how transactions are recorded - Financial statements: Profit &Loss account - balance sheet - cash flow statement - Fixed assets - depreciation and the capitalization of software development expense - Working capital and cash management - Using ratio analysis to assess corporate health and performance - Funding the business: equity - debt and other aspects - Budgeting &Forecasting – capex – apex - Designing a flexible budget - Capital expenditure appraisal and approval

TOTAL: 36 HOURS

TEXT BOOKS:

1 Dauer, R. M. (1993). *Accurate English: A Complete Course in Pronunciation*. Prentice Hall.

2 Timm, P. R. (2011). *Customer Service: Career Success through Customer Loyalty* (5th ed.). Prentice Hall.

3 Kepner, C. H., & Tregoe, B. B. (1997). *The New Rational Manager: An Updated Edition for a New World*. Princeton Research Press.

4 Flynn, N. P., & Flynn, T. P. (2003). *Writing Effective E-Mail: Improving Your Electronic Communication* (2nd ed.). Cengage Learning.

5 Brigham, E. F., & Houston, J. F. (2019). *Fundamentals of Financial Management* (15th ed.). Cengage Learning.

REFERENCE BOOKS:

1 Kenworthy, J. (1987). *Teaching English Pronunciation*. Longman.

2 Lucas, R. W. (2019). *Customer Service Skills for Success* (7th ed.). McGraw-Hill Education.

3 Robbins, S. P., & Judge, T. A. (2018). *Organizational Behavior* (18th ed.). Pearson.

4 Shipley, D., & Schwalbe, W. (2007). *Send: Why People Email So Badly and How to Do It Better*. Knopf.

5 Horngren, C. T., Harrison, W. T., & Oliver, M. S. (2019). *Accounting* (11th ed.). Pearson.

WEBSITES:

1 https://www.speechactive.com/

2 https://www.thebalancemoney.com/career-planning-6265513

CO,PO,PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	3	2	3	2	2	1	2	-	1	-	-	-	-	2	-
CO4	3	-	1	1	1	1	1	-	1	-	-	-	-	-	-	-	1
CO5	3	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-
Average	**3**	**-**	**2**	**1.3**	**2**	**1.5**	**1.5**	**1**	**1.5**	**1**	**1**	**-**	**-**	**-**	**-**	**2**	**1**

1-Low, 2-Medium, 3-Strong; '-' - No Correlation

Semester I

24CAP204* **PROFESSIONAL ELECTIVE - II** **5H-3C**

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

Semester I

24CAP205* **PROFESSIONAL ELECTIVE - III** **5H-3C**

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

24CAP211B BUILDING GENAI BASED APPLICATIONS – PRACTICAL 4H-3C

Instruction Hours / Week: L:0 T:0 P:4 **Marks:** Internal**:40** External**:60** Total**:100**

End Semester Exam:3Hours

PREREQUISITE:

- Python libraries

COURSE OBJECTIVES (CO):

- To address ethical issues and practical considerations related to the deployment of generative AI applications, including bias, copyright, and societal impact.
- To gain practical skills in designing, implementing, and fine-tuning generative AI models using popular frameworks such as TensorFlow, PyTorch, and Keras.
- To explore various applications of generative AI in fields such as image synthesis, text generation, music composition, and data augmentation.

COURSE OUTCOMES (COs):

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

COs	**Course Outcomes**	**Blooms Level**
CO1	Demonstrate a thorough understanding of the principles and algorithms underlying generative AI models.	Understand
CO2	Design, implement, and fine-tune generative AI models using leading AI frameworks and libraries.	Apply
CO3	Develop and deploy generative AI-based applications across various domains, demonstrating creativity and technical acumen.	Analyze
CO4	Implementing real-world projects that showcase the practical applications and benefits of generative AI.	Apply
CO5	Capable of evaluating and optimizing the performance of generative AI models, ensuring high-quality and reliable outputs.	Evaluate

LIST OF PROGRAMS **48 HOURS**

1 Take any large language model (say GPT 3.5) and try to execute some query through it. Create a small program where you can change the parameter values of Temperature, Top P and Max Tokens. Please identify how you can make your answer more deterministic?

2 Please identify what are the basic metrices to evaluate your large language model response? (As example, toxicity, biasness etc). Please write a short program where you can take model response as input and calculate the score for the above metrices to understand output quality.

3 Please write a program where you can perform keyword-based search. Please take any text file as input and provide "keyword" dynamically and see whether your algorithm can search it

effectively.

4 Please write a program where you take perform embedding based search. Please take any vector database and use any embedding technique to search the answer of the query from the given input text file where query and text files are the inputs of your program.

5 Please take 2/3 medical reports (may be blood reports) and store them in a place. Please write a program which can read all the files dynamically from the given locations. Please try to understand the metadata of the reports.

6 Create a set of questions for which you want to retrieve information from the medical reports through large language models. Save it in some database and keep in the excel file.

7 Apply large language model and Implement the RAG based approach to search the answer of the queries from the documents where two inputs will be taken: set of medical reports prepared in Experiment 5 and questions prepared in Experiment 6.

8 Perform the evaluation based on RAG-triad (Context Relevance, Groundedness and Answer Relevance). Show the importance of "context" towards getting the optimized output.

9 Use Palm 2 (or any other LLM) to perform automation of software development tasks which includes code generation, code debugging and test case generation.

10 Use any diffusion model to generate images based on given prompt.

11 Apply zero shot, one shot and few shot prompting and show how performance is improved in few shot prompting.

12 Apply chain-of-thought (CoT) in prompting and see how output accuracy increases. Do a comparison between normal prompting and CoT based prompting from output performance perspective.

13 Take a foundation model, create an instruction based fine tuning dataset, apply instruction fine tuning on the base model.

14 Perform performance evaluation of the model response between foundation model and after fine tuning it.

15 Explore various task specific benchmark datasets and try to create a new one.

TOTAL: 48 HOURS

TEXT BOOKS:

1 Deforest, E. R. (2024). *Prompt Engineering with Transformers and LLM*. Kindle.

2 Rehmani, A. (2024). *Generative AI for Everyone* (1st ed.). Altaf Rehmani.

REFERENCE BOOKS:

1 Foster, D. (2024). *Generative Deep Learning: Teaching Machines to Paint, Write, Compose, and Play*.

2 Gupta, D., & Srivastava, A. (2024). *The Potential of Generative AI: Transforming Technology, Business, and Art through Innovative AI Applications*.

WEBSITES:

1 https://www.techtarget.com/searchenterpriseai/definition/generative-AI

2 https://ai.google/discover/generativeai/

3 https://generativeai.net/

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	-	-	-	1	-	-	2	1	-	-	-	-	-	2	-
CO2	3	-	2	1	3	2	-	2	3	-	2	-	-	-	-	-	2
CO3	3	-	2	1	3	2	-	2	3	-	2	-	-	-	-	-	3
CO4	3	-	-	-	-	1	-	-	2	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	1	-	-	2	-	-	-	-	-	-	-	-
Average	**3**	**-**	**2**	**1**	**3**	**1.4**	**-**	**2**	**2.4**	**1**	**2**	**-**	**-**	**-**	**-**	**2**	**2.5**

1-Low, 2-Medium, 3-Strong; '-' - No Correlation

24CAP212B LARGE LANGUAGE MODELS - PRACTICAL 4H-3C

Instruction Hours / Week: L:0 T:0 P:4 **Marks:** Internal**:40** External**:60** Total**:100**

End Semester Exam:3Hours

PREREQUISITE:

- Basics of python libraries

COURSE OBJECTIVES (CO):

- To investigate various applications of LLMs in natural language processing tasks, including text generation, summarization, translation, and conversational agents.
- To gain practical experience in fine-tuning LLMs for specific tasks and mastering prompt engineering to elicit desired responses.
- To learn methods for Evaluate and optimizing the performance of LLMs, focusing on metrics such as accuracy, relevance, coherence, and ethical considerations.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Demonstrate a thorough understanding of the principles, architecture, and training processes of large language models.	Apply
CO2	Capable of evaluating and optimizing the performance of LLMs, ensuring high-quality and reliable outputs.	Evaluate
CO3	Develop and deploy applications that utilize LLMs for tasks such as text generation, summarization, and conversational AI.	Evaluate
CO4	Understand and be able to address ethical and societal implications of using LLMs, promoting responsible AI practices.`	Understand
CO5	Implementing real-world projects that showcase the practical applications and benefits of large language models.	Apply

LIST OF PROGRAMS **48 HOURS**

1 Present you POV on the evolution of Large Language Models. Articulate their growth, architecture changes and application landscape

2 Present your POV on the different fine-tuning methodologies. Articulate the differences, the advantages, and disadvantages of each approach.

3 Present your POV on the constitutional AI, how it's different from RLHF.

4 Present your POV on the Quantization of LLMs, different techniques that are available, performance of the Quantized Models in comparison to the Original Models

5 Present your POV on innovative architectures in transformer model that can lead to savings in

training or inference time. As an example, MoE from Mistral is one such unique architecture. Articulate tne performance of new architectures compared to the original architectures and come up with some new architecture that can lead to savings

6 Present your POV on the Sustainable AI, Ethical AI, Trustworthy AI

TOTAL: 48 HOURS

TEXT BOOKS:

1 Goodfellow, I., Bengio, Y., & Courville, A. (2016). *Deep learning*. MIT Press.

2 Rothman, D. (2021). *Transformers for natural language processing: Build state-of-the-art NLP systems with transformer models*. Packt Publishing.

REFERENCE BOOKS:

1 Honnibal, M., & Montani, I. (2020). *Advanced NLP with spaCy: A practical guide to building real-world NLP systems*. O'Reilly Media.

2 Clark, A., Fox, C., & Lappin, S. (Eds.). (2020). *Handbook of natural language processing* (2nd ed.). CRC Press.

WEBSITES:

1 https://www.sri.inf.ethz.ch/research/llm

2 https://www.media.mit.edu/publications/latent-lab-large-language-models-for-knowledge-exploration/

3 https://labs.iitgn.ac.in/lingo/large-language-models/

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	2	2	3	2	-	3	3	-	1	-	-	-	-	3	2
CO2	3	-	1	1	3	2	-	2	3	-	-	-	-	-	-	2	1
CO3	3	-	1	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CO4	3	-	2	-	3	3	-	1	2	-	1	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
Average	**3**	**-**	**1.5**	**1.5**	**3**	**2.3**	**-**	**2**	**2.7**	**-**	**1.5**	**-**	**-**	**-**	**-**	**2.5**	**1.5**

1-Low, 2-Medium, 3-Strong; '-' - No Correlation

24CAP206 **COMMUNITY ENGAGEMENT & SOCIAL RESPONSIBILITY** **2H-2C**

Instruction Hours / Week: L: 2 T: 0 P: 0 **Marks:** Internal**: 100** External**: 00** Total**: 100**

End Semester Exam:3 Hours

PRE-REQUISITE:

- Not required

COURSE OBJECTIVES (CO):

- To gain insights into the structures, challenges, and opportunities within communities
- To explore ethical frameworks and dilemmas related to community engagement and social responsibility
- To develop skills in monitoring, evaluating, and reporting on the outcomes of community engagement efforts to ensure effectiveness and accountability.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Understand the concept, ethics, and spectrum of community engagement	Understand
CO2	Recognize the significance in local community development and rural culture.	Understand
CO3	Know the rural development programs, institutions	Understand
CO4	Analyze the role of local administration in fostering community involvement and social networking.	Analyze
CO5	Develop skills in conducting community engaged research with a focus on ethics, rural distress, poverty alleviation, and disaster mitigation.	Apply

UNIT I INTRODUCTION AND PRINCIPLES **5 HOURS**

Concept, Ethics and Spectrum of Community engagement, Local community, Rural culture and Practice of community engagement - Stages, Components and Principles of community development, Utility of public resources. Contributions of self-help groups

UNIT II RURAL DEVELOPMENT **5 HOURS**

Rural Development Programs and Rural institutions Local Administration and Community Involvement-Social contribution of community networking, Various government schemes. Programmes of community engagement and their evaluation.

UNIT III COMMUNITY AND RESEARCH **5 HOURS**

Community Engaged Research and Ethics in Community Engaged Research Rural Distress, Rural Poverty, Impact of COVID-19 on Migrant Laborers, Mitigation of Disaster.

UNIT IV RURAL INSTITUTIONS AND MICRO GOVERNANCE SYSTEM **5 HOURS**

Traditional rural organisations, Self-help Groups, women empowerment initiatives, youth in governance, Local governance, Panchayati raj institutions (Gram Sabha, Gram Panchayat, Standing Committees), local civil society, local administration

4 HOURS

UNIT V GOVERNMENT PROGRAMS FOR RURAL DEVELOPMENT

History of rural development in India, current national programmes: Sarva Shiksha Abhiyan, Beti Bachao, Beti Padhao, Ayushman Bharat, Swachh Bharat, PM Awaas Yojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA, etc., national programs in SouthEast Asia-lessons learnt from India

TOTAL: 24 HOURS

TEXT BOOK:

2. Principles of Community Engagement, (2011).2nd Edition, NIH Publication No. 11-7782.

WEBSITES:

14. https://youtu.be/-SQK9RGBt7o
15. https://www.uvm.edu/sites/default/files/community_engagement_handout.pdf (Community Engagement)
16. https://www.atsdr.cdc.gov/communityengagement/pce_concepts.html (Perspectives of Community)
17. https://egyankosh.ac.in/bitstream/123456789/59002/1/Unit1.pdf (community concepts)
18. https://sustainingcommunity.wordpress.com/2013/07/09/ethics-and-community-engagement/(Ethics of community engagement)
19. https://www.preservearticles.com/sociology/what-are-the-essential-elements-of-community/4558 (Elements of Community)
20. https://www.yourarticlelibrary.com/sociology/rural-sociology/rural-community-top-10-characteristics-of-the-rural-community-explained/34968 (features of rural community)
21. https://www.mapsofindia.com/my-india/government/schemes-for-rural-development-launched-by-government-of-india (Government programmes for rural development)
22. https://www.yourarticlelibrary.com/sociology/rural-sociology/rural-community-top-10-characteristics-of-the-rural-community-explained/34968 (rural lifestyle)
23. https://www.insightsonindia.com/social-justice/issues-related-to-rural-development/government-schemes-for-rural-development-in-india/ (schemes for rural development)
24. https://www.mpgkpdf.com/2021/09/community-development-plan-in-hindi.html?m=1
25. https://images.app.goo.gl/sNF2HMWCuCfkqYz56
26. https://images.app.goo.gl/VaMNNMEs77XyPMrP7

CO, PO, PSO Mapping

CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	3	3	-	-	3	-	-	-	-	-	-	-	-	-	2	-	-
CO2	3	2	-	-	3	-	2	1	-	2	-	-	-	-	-	-	1
CO3	3	-	2	3	-	2	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	2	-	-	2	-	1	-	3	-	-	-	-	2	-	1
CO5	3	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	**3**	**2.5**	**2**	**2**	**3**	**2**	**2**	**1**	**-**	**2.5**	**-**	**-**	**-**	**-**	**2**	**-**	**1**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester II

JOURNAL PAPER ANALYSIS & PRESENTATION **1H-0C**

Instruction Hours / Week: L:1 T:0 P:0 **Marks:** Internal**:00** External**:00** Total**:000**

Semester III

24CAP301A ARTIFICIAL INTELLINGENCE AND MACHINE LEARNING 5H-4C

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To define the types and theory of machine learning.
- To describe the classification models of machine learning.
- To explain the techniques of distance-based models of machine learning.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes (COs)	Blooms Level
CO1	Summarize the Machine Learning Fundamentals	Understand
CO2	Analyze the concepts of Proficiency in Data Preparation and Preprocessing	Analyze
CO3	Develop the Skilful Model Evaluation and Feature Engineering of machine learning.	Create
CO4	Analyze the Classification and Regression Techniques	Analyze
CO5	Develop the program using python libraries for implementing machine learning techniques.	Create

UNIT I MACHINE LEARNING FUNDAMENTALS 12 HOURS

Machine Learning Landscape: Introduction- Types of Machine Learning Systems- Main Challenges of Machine Learning- Testing and Validating-End to End Machine Learning Project: Working with Real Data-Discover and visualize the data to gain insights Prepare the data for Machine Learning algorithms-Select and Train a model-Fine-Tune the model.

UNIT II FEATURE ENGINEERING 12 HOURS

Motivation towards Feature Engineering - Basic Feature engineering processes- Feature Selection-Dimensionality Reduction: The Curse of Dimensionality - Main Approaches for Dimensionality Reduction-PCA-Kernel PCA-LLE- Other Dimensionality Reduction Techniques.

UNIT III CONCEPTS OF CLASSIFICATION AND REGRESSION 12 HOURS

Classification: Training a Binary Classifier – Performance Measures - Multiclass Classification- Error Analysis- Multilabel Classification and Multioutput Classification-Training Models: Linear Regression-Gradient Descent- Polynomial Regression Learning Curves.

UNIT IV SUPERVISED LEARNING **12 HOURS**

Classification: Introduction-Example-Classification Model-Learning Steps- Common classification algorithms- K-Nearest Neighbor Decision Tree-Random Forest Model - Support Vector Machines. Regression: Introduction-Example-Multiple linear regression Assumptions and problems in Regression Analysis- Improving the accuracy.

UNIT V UNSUPERVISED LEARNING AND ARTIFICIAL NEURAL NETWORK 12 HOURS

Introduction - Unsupervised Learning Vs Supervised Learning – Applications – Clustering - Introduction-Biological neuron - Artificial Neuron- Types of activation function-Architectures of NN – Learning process in ANN – Backpropagation.

TOTAL: 60 HOURS

TEXT BOOKS:

1. AurelienGeron, (2019). *Hands – On Machine Learning with SciKit-Learn, Keras & Tensor Flow – Concepts, Tools and Techniques to Build Intelligent Systems*, 2nd Edition, O'Reilly Media.
2. SaikatDutt, Subramanian Chandramouli and Amit Kumar Das, (2019). *Machine Learning*, 1st Edition, Pearson Education, India.

REFERENCE BOOKS:

1. Henrik Brink, Joseph W Richards, Mark Fetherolf, (2018). *Real World Machine Learning*, 1st Edition Reprint, Dreamtech Press, New Delhi.

WEBSITE LINKS:

1. https://www.geeksforgeeks.org/machine-learning/
2. https://www.linkedin.com/pulse/artificial-intelligenceai-its-case-study-aachal-choudhary

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	-	1	1	-	-	-	-	3	-
CO2	3	-	2	2	3	2	-	2	3	-	-	-	-	-	-	-	2
CO3	3	-	3	3	2	3	-	3	-	-	-	-	-	-	-	-	1
CO4	3	-	2	2	3	2	-	2	3	-	-	-	-	-	-	-	-
CO5	3	-	3	3	2	3	-	3	-	-	-	-	-	-	-	-	-
Average	**3**	**-**	**2.5**	**2.5**	**2.5**	**2.5**	**-**	**2.5**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**3**	**1.5**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester III

24CAP302A RESEARCH METHODOLOGY AND IPR 5H-3C

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To select appropriate research methods based on the nature of their research questions and objectives.
- To learn techniques for conducting literature reviews and critically evaluating existing research.
- To communicate research findings effectively through written reports, presentations, and academic papers.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes (COs)	Blooms Level
CO1	Summarize the various research designs and techniques.	Understand
CO2	Compare various sources of information for literature review and data collection.	Analyze
CO3	Analyze the data and generate the report.	Analyze
CO4	Illustrate the concept of Intellectual Property Rights.	Understand
CO5	Summarize scientific writing skills, academic writing, patenting and avoid the common mistakes in the field of research methodology.	Understand

UNIT I RESEARCH DESIGN **12 HOURS**

Overview of research process and design, Use of Secondary and exploratory data to answer the research question, Qualitative research, Observation studies, Experiments and Surveys.

UNIT II DATA COLLECTION AND SOURCES **12 HOURS**

Measurements, Measurement Scales, Questionnaires and Instruments, Sampling and methods. Data - Preparing, Exploring, examining and displaying.

UNIT III DATA ANALYSIS AND REPORTING **12 HOURS**

Overview of Multivariate analysis, Hypothesis testing and Measures of Association. Presenting Insights and findings using written reports and oral presentation.

UNIT IV INTELLECTUAL PROPERTY RIGHTS **12 HOURS**

Intellectual Property – The concept of IPR, Evolution and development of concept of IPR, IPR development process, Trade secrets, utility Models, IPR & Bio diversity, Role of WIPO and WTO in IPR establishments, Right of Property, Common rules of IPR practices, Types and Features of IPR Agreement, Trademark, Functions of UNESCO in IPR maintenance.

UNIT V PATENTS **12 HOURS**

Patents – objectives and benefits of patent, Concept, features of patent, Inventive step, Specification, Types of patent application, process E-filling, Examination of patent, Grant of patent, Revocation, Equitable Assignments, Licenses, Licensing of related patents, patent agents, Registration of patent agents.

TOTAL: 60 HOURS

TEXT BOOKS:

1. Cooper Donald R, Schindler Pamela S and Sharma JK, (2012). *Business Research Methods*, Tata McGraw Hill Education, 11th Edition.
2. Catherine J. Holland, (2012). *Intellectual property: Patents, Trademarks, Copyrights, Trade Secrets, Entrepreneur Press*, 3rd Edition.

REFERENCE BOOKS:

1. David Hunt, Long Nguyen, Matthew Rodgers, (2007). *Patent searching: tools & techniques*, Wiley.
2. The Institute of Company Secretaries of India, Statutory body under an Act of parliament, (2013). *Professional Programme Intellectual Property Rights, Law and practice.*

WEBSITE LINKS:

1. https://esu.desire2learn.com/
2. https://www.reading.ac.uk/research-services/research-data-management/data-management-planning/intellectual-property-rights-and-research-data
3. https://en.wikipedia.org/wiki/Intellectual_property

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	1	-	-	1	-	-	-	1	-	-	-	-	-	3	-
CO2	3	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-
CO3	3	-	2	3	3	2	-	1	3	-	-	-	-	-	-	-	2
CO4	3	-	-	-	1	-	-	-	1	-	-	-	2	2	-	-	-
CO5	3	-	1	2	-	1	-	1	-	-	2	-	-	3	-	-	-
Average	**3**	**-**	**1.3**	**2.5**	**1.7**	**1.3**	**-**	**1**	**1.7**	**1**	**2**	**-**	**2**	**2.5**	**-**	**3**	**2**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester I

24CAPOE301 **OPEN ELECTIVE** **3H-2C**

Instruction Hours / Week: L: 3 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

Semester I

24CAP304* **PROFESSIONAL ELECTIVE - IV** **5H-3C**

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

Semester I

24CAP305* **PROFESSIONAL ELECTIVE - V** **5H-3C**

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

Semester III

24CAP311A **MACHINE LEARNING - PRACTICAL** **5H-3C**

Instruction Hours / Week: L: 0 T: 0 P: 5 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- Perform data manipulation, aggregation, and transformation operations.
- Compute descriptive statistics such as mean, median, variance, and standard deviation.
- Analyze relationships between variables using correlation and covariance.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes (COs)	Blooms Level
CO1	Demonstrate the machine learning problems using Python	Understand
CO2	Implement algorithms to solve simple machine learning problems	Create
CO3	Implement the Advanced Model Skills	Create
CO4	Implement the Probabilistic Models	Create
CO5	Analyze the performance of machine learning solutions on practical datasets	Analyze

List of Experiments **TOTAL: 60 HOURS**

1. Exploration of a Data Set in the IDE, to perform various pandas operations.
2. Exploration of a Data Set in the IDE , to perform various numpy operations.
3. Write a python program to calculate mean, median, variance, standard deviation and exploring relationship between variables of the given numerical data.
4. Implement various data preprocessing techniques on real time dataset using python.
5. Develop a python code to perform dimensionality reduction using PCA.
6. Write a python code to perform different visualization for the given data set.
7. Construct a python program to find the attribute with maximum information gain and gain ratio and construct the decision tree for the given data.
8. Develop a python program to implement K-NN algorithm for the given data.
9. Develop a python program to implement Random Forest Algorithm for the given data.
10. Construct a python program to implement Support Vector Machines learning algorithm for the given data.
11. Write a python program to implement Naïve Bayes Classifier Algorithm for the given data.
12. Construct a python code to implement Simple Linear regression for the given data.
13. Develop a python code to implement Multi Linear regression algorithms for the given data set.

14. Write a python program to implement k-means clustering algorithm.
15. Implement Multi-Layer Artificial Neural Network analysis for the given dataset using python code.

TOTAL: 60 HOURS

TEXT BOOKS

1. AurelienGeron, (2019). *Hands – On Machine Learning with SciKit-Learn, Keras & Tensor Flow – Concepts, Tools and Techniques to Build Intelligent Systems*, 2nd Edition, O'Reilly Media.
2. SaikatDutt, Subramanian Chandramouli and Amit Kumar Das, (2019. Machine Learning, 1st Edition, Pearson Education, India.

REFERENCE BOOKS

1. Henrik Brink, Joseph W Richards, Mark Fetherolf, Real World Machine Learning, 1st Edition Reprint, Dreamtech Press, New Delhi, 2018.

WEBSITE LINKS

1. https://www.geeksforgeeks.org/machine-learning/
2. https://www.linkedin.com/pulse/artificial-intelligenceai-its-case-study-aachal-choudhary

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	2	2	2	-	-	-	-	3	-
CO2	3	-	3	3	3	2	-	1	3	-	-	-	-	-	-	-	2
CO3	3	-	3	3	3	2	-	1	3	-	-	-	-	2	-	-	-
CO4	3	-	3	3	3	2	-	1	3	-	-	-	2	-	-	-	1
CO5	3	-	2	2	2	1	1	1	2	-	-	-	-	-	-	-	-
Average	**3**	**-**	**2.8**	**2.8**	**2.8**	**1.8**	**1**	**1**	**2.6**	**2**	**2**	**-**	**2**	**2**	**-**	**3**	**1.5**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester III

24CAP312A PROFESSIONAL ELECTIVE IV - PRACTICAL 5H-3C

Instruction Hours / Week: L: 0 T: 0 P: 5 **Marks:** Internal**: 100** External**: 0** Total**: 100**

End Semester Exam:3 Hours

MASTER OF COMPUTER APPLICATIONS **2024-2025**

Semester II

JOURNAL PAPER ANALYSIS & PRESENTATION **2H-0C**

Instruction Hours / Week: L:2 T:0 P:0 **Marks:** Internal**:00** External**:00** Total**:000**

Semester III

24CAP391A	**INTERNSHIP**	**0H-2C**

Instruction Hours / Week: L: 0 T: 0 P: 0 **Marks:** Internal**: 100** External**: 0** Total**: 100**

End Semester Exam:3 Hours

Semester III

24CAP301B* **PROFESSIONAL ELECTIVE IV** **5H-4C**

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

Semester III

24CAP391B	**PROJECT / THESIS - I**	**30H-12C**

Instruction Hours / Week: L: 0 T: 0 P: 30 **Marks:** Internal**: 100** External**: 0** Total**: 100**

End Semester Exam:3 Hours

Semester III

24CAP491	**PROJECT AND VIVA VOCE**	**12C**

Instruction Hours / week: L:0 T:0 P:0 **Marks:** Internal**: 80** External**: 120 Total: 200**

End Semester Exam: 3 Hours

24CAP105PE1 **PRINCIPLES OF MANAGEMENT** **4H-3C**

Instruction Hours / Week: L: 4 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To introduce the fundamental principles, concepts, and functions of management.
- To provide insights into individual and group behavior within organizations, including motivation, leadership, communication, and decision-making.
- To familiarize with the essential managerial functions of planning, organizing, leading, and controlling.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Exhibit the appropriate management techniques for managing business	Understand
CO2	Show the conceptual knowledge about the planning and decision making	Understand
CO3	Apply the concept of organising for the effective functioning of a management	Apply
CO4	Evaluate leadership style to anticipate the consequences of each leadership style	Evaluate
CO5	Analyze the techniques for controlling and coordination	Analyze

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS **9 HOURS**

Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises - Organization culture and Environment – Current trends and issues in Management.

UNIT II PLANNING **9 HOURS**

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

UNIT III ORGANISING **10 HOURS**

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and

decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.

UNIT IV DIRECTING **10 HOURS**

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication – communication and IT.

UNIT V CONTROLLING **10 HOURS**

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

TOTAL: 48 HOURS

TEXT BOOKS:

1. Stephen A. Robbins & David A. Decenzo & Mary Coulter, (2011). *Fundamentals of Management*, 7th Edition, Pearson Education.
2. Robert Kreitner & Mamata Mohapatra, (2008). *Management*, Biztantra.

REFERENCE BOOKS:

1. Harold Koontz & Heinz Weihrich, (1998). *Essentials of management*, Tata McGraw Hill.
2. Tripathy PC & Reddy PN, *Principles of Management*, Tata McGraw Hill.

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
CO2	3	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO3	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
CO4	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO5	3	2	1	-	-	-	1	-	-	-	-	-	-	-	-	-	1
Average	2.4	1.4	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

24CAP105PE2 GENERATIVE ADVERSARIAL NETWORKS 4H-3C

Instruction Hours / Week: L:4 T:0 P:0 **Marks:** Internal**:40** External**:60** Total**:100**

End Semester Exam:3Hours

PREREQUISITE:

- Optimization Techniques, Digital Communication.

COURSE OBJECTIVES (CO):

- To learn the historical development and motivation behind GANs.
- To understand the unique characteristics and applications of various GAN variants.
- To analyze case studies to understand the impact of GANs in different fields.

COURSE OUTCOMES (COS):

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

COs	Course Outcomes	Blooms Level
CO1	Understand generative models such as generative adversarial networks (GANs) and their advanced techniques.	Understand
CO2	Build sophisticated and robust GAN models using PyTorch & convolutional layers etc.,	Apply
CO3	Learn about the advantages and disadvantages of different GAN performance measures.	Understand
CO4	Explore and examine the applications of GANs	Evaluate
CO5	Identify potential areas for future research and innovation in GANs.	Apply

UNIT I BUILD BASIC GENERATIVE ADVERSARIAL NETWORKS (GANs) 9 HOURS

Overview of GenAI - Intro to GANs - Learn about GANs and their applications, understand the intuition behind the basic components of GANs -build your very own GAN using PyTorch - Deep Convolutional GAN - Build a more sophisticated GAN using convolutional layers - Learn about useful activation functions - batch normalization - and transposed convolutions to tune your GAN architecture and apply them to build an advanced DCGAN specifically for processing images - Wasserstein GANs with Normalization - Reduce instances of GANs failure due to imbalances between the generator and discriminator by learning advanced techniques such as WGANs to mitigate unstable training and mode collapse with a W-Loss and an understanding of Lipschitz Continuity - Conditional and Controllable GANs - Understand how to effectively control your GAN - modify the features in a generated image - and build conditional GANs capable of generating examples from determined categories.

UNIT II BUILD BETTER GENERATIVE ADVERSARIAL NETWORKS (GANs) 9 HOURS

GAN Evaluation - Understand the challenges of evaluating GANs - learn about the advantages and disadvantages of different GAN performance measures - and implement the Fréchet Inception Distance FID method using embeddings to assess the accuracy of GANs -GAN Disadvantages and Bias - Find out the disadvantages of GANs when compared to other generative models - discover the pros/cons of these models

UNIT III: BUILD BETTER GENERATIVE ADVERSARIAL NETWORKS (GANs) 10 HOURS

Plus - learn about the many places where bias in machine learning can come from - why it's important - and an approach to identify it in GANs - StyleGAN and Advancements - Understand how StyleGAN improves upon previous models and implements the components and the techniques associated with StyleGAN - currently the most state-of-the-art GAN with powerful capabilities.

UNIT IV APPLY GENERATIVE ADVERSARIAL NETWORKS (GANs) 10 HOURS

GANs for Data Augmentation and Privacy Preservation - Explore the applications of GANs and examine them wrt data augmentation, privacy, and anonymity Improve your downstream AI models with GAN-generated data - Image-to-Image Translation - Leverage the image-to-image translation framework and identify extensions – generalizations - applications of this framework to modalities beyond images.

UNIT V APPLY GENERATIVE ADVERSARIAL NETWORKS (GANs) 10 HOURS

Implement Pix2Pix - a paired image-to-image translation GAN - to adapt satellite images to map routes with advanced U-Net generator -Patch GAN discriminator architectures - Image-to-Image Unpaired Translation - Compare paired image-to-image translation to unpaired image-to-image translation and identify how their key difference necessitates different GAN architectures - Implement Cycle GAN- an unpaired image-to-image translation model, to adapt horses to zebras with two GANs in one. **TOTAL: 48 HOURS**

TEXT BOOKS:

1 Langr, J., & Bok, V. (2019). *GANs in Action: Deep learning with Generative Adversarial Networks*. Manning.

2 Hany, J. (2019). *Hands-On Generative Adversarial Networks with PyTorch 1.x*. Packt Publishing.

REFERENCE BOOKS:

1 Kang, S., & Bali, R. (2019). *Generative Adversarial Networks: A Practical Guide*.

2 Kalin, J. (2021). *Generative Adversarial Networks Cookbook: Over 100 Recipes to Build and Train GANs Using Python, TensorFlow, and Keras*.

WEBSITES:

1 https://machinelearningmastery.com/what-are-generative-adversarial-networks-gans/

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	3	3	1	1	-	-	2	-	1	-	-	-	-	3	2
CO2	3	-	3	3	2	2	-	2	2	-	-	-	-	-	-	2	1
CO3	3	-	3	2	2	2	-	1	3	-	-	-	-	-	-	3	3
CO4	3	-	3	3	3	3	-	1	2	-	-	-	-	-	-	-	-
CO5	3	-	3	3	1	1	-	1	2	-	1	-	-	-	-	3	3
Average	**3**	**-**	**3**	**2.8**	**1.8**	**1.8**	**-**	**1.3**	**2.2**	**-**	**1**	**-**	**-**	**-**	**-**	**2.8**	**2.3**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

24CAP204D DATA MINING AND DATA WAREHOUSING 5H-3C

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To gain the knowledge of the concepts and techniques in data mining
- To understand the data mining functionalities and pattern classification.
- To understand the cleaning and clustering process of data mining.

COURSE OUTCOMES (COs):

Upon completion of this course, Students will able to

COs	Course Outcomes	Blooms Level
CO1	Summarize the principle concepts of datamining and data mining.	Understand
CO2	Explain the classification and regression algorithms.	Understand
CO3	Compare various mining rules.	Analyze
CO4	Classify the types of data mining.	Understand
CO5	Illustrate the essentials of Data modeling.	Understand

UNIT I INTRODUCTION **12 HOURS**

Motivation and importance, Data Mining, Relational Databases, Data Warehouses, Transactional Databases, Advanced Database Systems and Advanced Database Applications, Data Mining Functionalities, Pattern Classification of Data Mining Systems, Major issues in Data Mining. Pre-process the Data- Data Cleaning, Data Integration and Transformation.

UNIT II CLASSIFICATION AND REGRESSION ALGORITHMS **12 HOURS**

Naïve Bayes – Multiple Regression Analysis – Logistic Regression – k-Nearest Neighbour Classification – GMDH –Computing and Genetic Algorithms. Support Vector Machines: LinearSVM - SVM with soft margin – Linear kernel – Proximal SVM – Generating Datasets.Cluster Analysis: Partitional Clusterings – k-medoids – Birch

UNIT III MINING RULE **12 HOURS**

Mining Frequent Patterns, **Association rule Mining** : Associations and Correlations: Basic Concepts – Frequent Item Set Mining Methods – Apriori Algorithm: Finding Frequent Itemsets by Confined Candidate Generation – Generating Association Rules from Frequent Itemsets – Improving the Efficiency of Apriori – A Pattern–Growth Approach for Mining Frequent Itemsets – Mining Frequent Itemsets Using the Vertical Data Format – Mining Closed and Max Patterns – Pattern Evaluation Methods – Constraint–Based Frequent Pattern Mining.

UNIT IV TYPES OF MINING **12 HOURS**

Mining Complex Types of Data: Mining Spatial Databases – Time- series and Sequence Data – Text Databases – Web Data Mining – Multimedia Data Mining- Search Engines- - Applications of Machine Learning in Data Mining- Machine learning VS Data Mining.

UNIT V DATA WAREHOUSE AND OLAP TECHNOLOGY **12 HOURS**

Data Warehouse: Basic Concepts – Data Warehouse Modeling – Data Cube and OLAP – Data Warehouse Design and Usage: A Business Analysis Framework for Data Warehouse Design – Data Warehouse Design Process – Architecture of Data Warehousing- Data Mart- Data Warehouse Usage for Information Processing – From Online Analytical Processing to Multidimensional Data Mining – Data Warehouse Implementation.

TOTAL: 60 HOURS

TEXT BOOKS:

1. Jiawei Han and Micheline Kamber, (2011). *Data Mining Concepts and Techniques*, 3rd Edition, Elsivier, India.
2. G.K.Gupta, (2006). *Introduction to Data Mining with Case Studies*, Prentice Hall India, NewDelhi.
3. Soman.K.P, Shyam Divakar and V. Ajay, (2008). *Insight to Data Mining- Theory and Practical*, Prentice Hall India, New Delhi.

REFERENCE BOOKS:

1. Gupta.G.K., (2006). *Introduction to Data Mining with Case Studies*, Prentice Hall India, NewDelhi.
2. Kantardzic, (2005). *Mining Concepts, Models, Methods and Algorithms*, IEEE Press – A John Wiley& Sons.

WEBSITE LINKS:

1. https://www.thearling.com/text/dmwhite/dmwhite.htm
2. https://www.classcentral.com/course/swayam-data-mining-9821

CO, PO, PSO Mapping

COs	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	3	-	-	1	-	1	-	-	1	1	1	-	-	-	-	3	-
CO2	3	-	2	3	-	2	-	2	2	-	-	-	-	-	-	1	-
CO3	3	-	2	3	-	1	-	1	1	-	-	-	-	-	-	-	2
CO4	3	-	-	-	-	2	-	1	-	-	1	-	-	-	-	-	-
CO5	3	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-
Average	**3**	**-**	**2**	**2**	**-**	**1.5**	**-**	**1.3**	**1.3**	**1**	**1**	**-**	**-**	**-**	**-**	**2**	**2**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester II

24CAP204N CRYPTOGRAPHY AND NETWORK SECURITY 5H-3C

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To teach fundamental aspects of security in a modern networked environment with the focus on system design aspects and cryptography in the specific context of network.
- To build protection mechanisms in order to secure computer networks.
- To write coding to encrypt "Plain Text" into "Cipher Text" and vice versa, using different encryption algorithms.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Classify the symmetric encryption techniques and illustrate various public key cryptographic techniques	Analyze
CO2	Illustrate the message authentication and hash algorithms.	Understand
CO3	Analyze Security Risks and Mitigation Strategies	Analyze
CO4	Summarize the basic concepts of web security	Understand
CO5	Summarize about the blockchain technology.	Understand

UNIT I- INTRODUCTION TO CRYPTOGRAPHY 12 HOURS

Introduction to Cryptography – Security Attacks – Security Services – Security Algorithm – Stream cipher and Block cipher – Symmetric and Asymmetric – Key Cryptosystem; SymmetricKey Algorithms: Introduction – DES – Triple DES – AES – IDEA – Blowfish – RC5.

UNIT II- PUBLIC KEY CRYPTOSYSTEM 12 HOURS

Public Key Cryptosystem: RSA Algorithm – Key Management – Diffie-Hell man key exchange – Introduction to Elliptic Curve Cryptography; MessageAuthentication and Hash functions – Hash and Mac Algorithm – Digital Signatures and Authentication Protocol.

UNIT III NETWORK SECURITY PRACTICE 12 HOURS

Authentication Applications – Kerberos – X.509 Authentication Services and Encryption Techniques: E-mail security – PGP – s/MIME – IP Security.

UNIT IV WEB SECURITY AND STEGANOGRAPHY 12 HOURS

Web Security – Secure Socket Layer – Secure Electronic Transaction; System Security – Intruders and Viruses – Firewalls – Password Security. **Case Study:** Network Forensic – Security Audit; Other Security

Mechanism: Introduction to Stenography – Quantum Cryptography – Water Marking – DNA Cryptography.

UNIT V BASICS OF BLOCKCHAIN TECHNOLOGY **12 HOURS**

Distributed Database, Two General Problem, Byzantine General Problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete. **Cryptography:** ECDSA, Memory Hard Algorithm, and Zero Knowledge Proof.

TOTAL: 60 HOURS

TEXT BOOKS:

1. William Stallings, (2013). *Cryptography and Network Security*, 6th Edition. Pearson Education, New Delhi.
2. Menezes, P. Van Oorschot and Vanstone, (2010). *Hand Book of Applied Cryptography*, 2nd Edition. CRC Press, New Delhi.

REFERENCE BOOKS:

1. Ankit Fadia, (2010). *Network Security*, 2nd Edition. McMillan India Ltd, New Delhi.
2. Bruce Schneir, (2006). *Applied Cryptography*, 2nd Edition. CRC Press, New Delhi.

WEBSITE LINKS

1. williamstallings.com/Crypto3e.html
2. u.cs.biu.ac.il/~herzbea/book.html

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	3	1	2	2	-	1	2	1	2	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-
CO3	3	-	2	2	3	2	-	2	3	-	-	-	-	-	-	2	3
CO4	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-
Average	**3**	**-**	**2.5**	**1.5**	**2**	**2**	**-**	**1.5**	**2**	**1**	**1.5**	**-**	**-**	**-**	**-**	**2**	**3**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester II

24CAP204S OBJECT ORIENTED SOFTWARE ENGINEERING 5H-3C

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To teach techniques and methodologies for analyzing and designing software systems using object-oriented principles.
- To emphasize the importance of software quality assurance and testing in object-oriented software development.
- To introduce testing techniques such as unit testing, integration testing, and acceptance testing, with a focus on how OOP facilitates testing practices.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes (COs)	Blooms Level
CO1	Demonstrate the phases in object-oriented software development	Understand
CO2	Summarize fundamental concepts of requirements engineering and analysis.	Understand
CO3	Compare the different approach for object-oriented design and its methods	Analyze
CO4	Explain about how to perform object-oriented testing and how to maintain software	Understand
CO5	Measure the various quality metrics and to ensure risk management.	Evaluate

UNIT I SOFTWARE DEVELOPMENT AND PROCESS MODELS 12 HOURS

Introduction to Software Development – Challenges – An Engineering Perspective – Object Orientation – Software Development Process – Iterative Development Process – Process Models – Life Cycle Models – Unified Process – Iterative and Incremental – Agile Processes.

UNIT II MODELLING OO SYSTEMS 12 HOURS

Object Oriented Analysis (OOA / Coad-Yourdon), Object Oriented Design (OOD/Booch), Hierarchical Object-Oriented Design (HOOD), Object Modeling Technique (OMT) – Requirement Elicitation – Use Cases – SRS Document – OOA - Identification of Classes and Relationships, Identifying State and Behavior – OOD - Interaction Diagrams – Sequence Diagram – Collaboration Diagrams - Unified Modeling Language and Tools.

UNIT III DESIGN PATTERNS **12 HOURS**

Design Principles – Design Patterns – GRASP – GoF – Dynamic Object Modeling – Static Object Modeling – Prompt Engineering Formal and Agile Methodologies: The Nature of software- Software Engineering – Software Process Models – Prescriptive process model–Specialized process model- The Unified Process – Agile Development: Agile Process – Extreme Programming-Other Agile process

UNIT IV SYSTEM TESTING **12 HOURS**

Software testing: Software Verification Techniques – Object Oriented Checklist :- Functional Testing – Structural Testing – Class Testing – Mutation Testing – Levels of Testing – Static and Dynamic Testing Tools - Software Maintenance – Categories – Challenges of Software Maintenance – Maintenance of Object Oriented Software – Regression Testing

UNIT V SOFTWARE QUALITY AND METRICS **12 HOURS**

Software testing: Software Verification Techniques – Object Oriented Checklist :- Functional Testing – Structural Testing – Class Testing – Mutation Testing – Levels of Testing – Static and Dynamic Testing Tools - Software Maintenance – Categories – Challenges of Software Maintenance – Maintenance of Object Oriented Software – Regression Testing.

TOTAL: 60 HOURS

TEXT BOOKS:

1. Yogesh Singh, RuchikaMalhotra, (2012). *Object – Oriented Software Engineering*, First edition, PHI Learning Private Limited.
2. Ivar Jacobson. Magnus Christerson, PatrikJonsson, Gunnar Overgaard, (2009). *Object Oriented Software Engineering, A Use Case Driven Approach*, Pearson Education, Seventh Impression.

REFERENCE BOOKS:

1. Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Jim Conallen, Kelli A. Houston, (2010). *Object Oriented Analysis & Design with Applications*, Third Edition, Pearson Education.
2. Roger S. Pressman, (2015). *Software Engineering: A Practitioner's Approach*, 8th Edition, Tata McGraw-Hill Education.

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	1	1	-	2	-	-	1	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	1	1	-	1	-	-	-	-	-	2
CO3	3	-	-	-	-	1	-	2	-	-	1	-	-	-	-	-	-
CO4	3	-	1	-	-	-	-	-	2	-	-	-	-	-	-	-	-
CO5	3	-	1	-	-	3	-	-	-	-	-	-	-	-	-	1	-
Average	**3**	**-**	**1**	**1**	**-**	**2**	**-**	**1.5**	**1.3**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**2**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester II

24CAP204W **ADVANCED WEB TECHNOLOGY** **5H-3C**

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To delve into advanced topics in HTML5, CSS3, and JavaScript, including newer features and best practices.
- To explore responsive web design techniques and frameworks like Bootstrap for building modern, mobile-friendly web interfaces.
- To teach advanced JavaScript frameworks and libraries such as React.js, Vue.js, or Angular for creating interactive and dynamic web applications.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Explain the Core Concepts of the Web	Understand
CO2	Design the web pages using Cascading Style Sheet	Create
CO3	Develop the JavaScript for DOM Manipulation	Apply
CO4	Design dynamic documents using JavaScript	Create
CO5	Summarize the Browser Event Models	Understand

UNIT I WEB FUNDAMENTALS **12 HOURS**

Web Fundamentals: Internet, WWW, Web Browsers and Web Servers, URLs, MIME, HTTP, Security, the Web Programmers Toolbox. Introduction to XHTML: Basic syntax, Standard structure, Basic text markup, Images, Hypertext Links. Lists, Tables, Forms, Frames, Syntactic differences between HTML and XHTML.

UNIT II INTRODUCTION TO HTML5 **12 HOURS**

New features of HTML5, HTML5 DocType, HTML5 Structure, Tags- nav, section, article, aside, header, footer, HTML5 Form Elements- Search, tel, url, email, number and range, HTML5 Media tags- Audio and video. Cascading Style Sheets: Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The box model, Background images, The and tags, Conflict resolution.

UNIT III THE BASICS OF JAVASCRIPT **12 HOURS**

Overview of JavaScript, Object orientation and JavaScript, general Syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Object creation and

modification, Arrays, Functions, Constructors, Pattern matching using regular expressions, Errors in scripts. JavaScript and XHTML Documents: The JavaScript Execution Environment, The Document Object Model, Elements Access in Java Script, Events and Event Handling, Handling Events from Body Elements, Handling Events from Text Box and password Elements, The DOM2 Model, The navigator Object, Dom Tree Traversal and Modification.

UNIT IV DYNAMIC DOCUMENTS WITH JAVASCRIPT **12 HOURS**

Introduction, Positioning Elements, Moving Elements, Element Visibility, Changing Colors and Fonts, Dynamic Content, Stacking Elements, Locating the Mouse Cursor, Reacting to a Mouse Click, Slow Movement of Elements, Dragging and Dropping Elements. **Introduction to XML:** Introduction, Syntax of XML, XML Document Structure, Document type definitions, Namespaces, XML schemas, displaying raw XML documents, Displaying XML documents with CSS, Web services.

UNIT V INTRODUCTION TO JQUERY **12 HOURS**

Introducing jQuery, jQuery fundamentals, Creating the wrapped element set, bringing pages to life with jQuery, Understanding the browser event models, The jQuery Event Model, Sprucing up with animations and effects.

TOTAL : 60 HOURS

TEXT BOOKS:

1. Harvey & Paul Deitel & Associates, Harvey Deitel and Abbey Deitel, “Internet and World Wide Web - How to Program”, 5th Edition, Pearson Education, 2011.
2. Achyut S Godbole and Atul Kahate, “Web Technologies”, 2nd Edition, Tata McGraw Hill, 2012.

REFERENCE BOOKS:

1. Thomas A Powell, Fritz Schneider, “JavaScript: The Complete Reference”, 3rd Edition, Tata McGraw Hill, 2013.

WEBSITE LINKS:

1. https://www.w3schools.com/css/css_intro.asp
2. https://www.yaldex.com/javascript_tutorial_2/LiB0004.html

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	-	1	-	-	-	-	1	-	1	-	-	-	-	1	-
CO2	3	-	1	-	-	1	-	2	1	-	1	-	-	-	-	-	1
CO3	3	-	2	3	2	3	-	2	-	-	-	-	-	-	-	-	1
CO4	3	-	-	-	3	1	-	1	1	-	-	-	-	-	-	-	-
CO5	3	-	1	-	-	-	-	1	-	-	-	-	-	-	-	2	-
Average	**3**	**-**	**1.3**	**2**	**2.5**	**1.7**	**-**	**1.5**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**1.5**	**1**

1 - Low, 2 - Medium, 3 - High, ‘-' - No Correlation

24CAP205D DISTRIBUTED DATABASE MANAGEMENT SYSTEM 5H-3C

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To design good performing distributed database schemas.
- To create optimized query execution plan.
- To efficiently distribute and manage the data.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Summarize the basic concept of database management systems	Understand
CO2	Analyze Distribution Transparency concepts, including location transparency, fragmentation transparency, and replication transparency	Analyze
CO3	Explain the Master Concurrency Control in Distributed Database Systems	Understand
CO4	Demonstrate how to handle the deadlock in the database operation	Understand
CO5	Analyze the various database security techniques for protecting data security	Analyze

UNIT I – INTRODUCTION TO DATABASE CONCEPTS 12 HOURS

Database concepts: Data Models- Database Operations- Database Management-DB Clients, Servers, and Environments. DBE Architecture**:** Services- Components and Subsystems- Sites - Expected Services-Expected Subsystems- Typical DBMS Services**–** DBE Taxonomy**:** COS Distribution and Deployment- COS Closeness or Openness-Schema and Data Visibility- Schema and Data Control.

UNIT II – DESIGN ALTERNATIVES AND FRAGMENTATION 12 HOURS

Data Distribution Alternatives: Design Alternatives - Localized Data - Distributed Data. Fragmentation: Vertical Fragmentation- Horizontal Fragmentation - Distribution Transparency: Location Transparency- Fragmentation Transparency - Replication Transparency - Location, Fragmentation, and Replication Transparencies.

UNIT III QUERY OPTIMIZATION 12 HOURS

Query Optimization: Sample Database- Query Processing in Centralized Systems: Query Parsing and Translation - Query Optimization- Query Processing in Distributed Systems- Heterogeneous Database

Systems - Concurrency Control in Distributed Database Systems.

UNIT IV DEADLOCK HANDLING **12 HOURS**

Deadlock Handling: Deadlock Definition- Deadlocks in Centralized Systems- Deadlocks in Distributed Systems- Distributed Deadlock Detection. Replication Control: Replication Control Scenarios. Failure and Commit Protocols: Terminology- Commit Protocols.

UNIT V DDBE SECURITY **12 HOURS**

DDBE Security: Cryptography- Securing Data. Traditional DDBE Architectures: Classifying the Traditional DDBMS Architecture- The MDBS Architecture Classifications- Approaches for Developing A DDBE- Deployment of DDBE Software.

TOTAL: 60 HOURS

TEXT BOOKS:

1. Saeed K. Rahimi And Frank S. Haug, (2010). *Distributed Database Management Systems : A Practical Approach*, 1st Edition, A John Wiley & Sons, Inc., Publication.
2. Tamer Ozus M,Patrick Valduriez ,S.Sridhar, (2006). *Principle Of Distributed Database Systems*, 1st Edition , Pearson Education.

REFERENCE BOOKS:

1. William M.New Man, Robort F.Sproull, (2004). *Principles of Interactive Computer Graphics*, 1st Edition, Pearson Education.

WEBSITE LINKS:

1. http://www.en.wikipedia.org/wiki/Distributed_computing
2. www.webopedia.com/TERM/D/distributed_computing.html
3. www.tech-faq.com/distributed-computing.shtml
4. http://www.inf.unibz.it/dis/teaching/DDB/ln/ddb01.pdf

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	-	-	-	1	-	-	1	1	1	-	-	-	-	-	2
CO2	3	-	3	2	3	2	-	2	3	-	-	-	-	-	-	-	-
CO3	3	-	-	1	-	-	-	-	1	-	-	-	-	-	-	1	-
CO4	3	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-	-
CO5	3	-	3	2	3	2	-	2	3	-	-	-	-	-	-	-	-
Average	**3**	**-**	**3**	**1.7**	**2.7**	**1.7**	**-**	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**2**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

24CAP205N **TCP/IP** **5H-3C**

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To learn about IPv4 forwarding and routing.
- To learn the Domain Name System (DNS).
- To know the Architectural Overview of the TCP/IP Protocol Suite.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Summarize the TCP/IP protocol suite, including its layered architecture, individual protocols within each layer	Understand
CO2	Outline the knowledge of ICMP Message Types and Formats	Understand
CO3	Explain the routing and routed protocols in TCP/IP	Understand
CO4	Demonstrate to deploy and manage robust and scalable network infrastructures in enterprise environments	Understand
CO5	Analyze to manage secure and efficient remote access solutions using protocols such as FTP, SMTP, and SNMP	Analyze

UNIT I INTRODUCTION **12 HOURS**

Introduction: WAN, WAN technologies - Internetworking concepts - Protocols and Standards - TCP/IP protocol suite - Internetworking Devices – Routing Concept - Classful IP Addressing – Subnetting – Super netting – Classless Addressing.

UNIT II ARP & RARP **12 HOURS**

ARP & RARP – Proxy ARP – ARP over ATM – ARP and RARP Protocol Format. IP Datagram-Fragmentation – Options – IP Datagram Format – Routing IP Datagrams – Checksum. IP Package ICMP: Types of Messages - Message Format – Error Reporting – Query – Checksum - ICMP Package.

UNIT III ROUTING AND ROUTED PROTOCOLS **12 HOURS**

Routing and Routed Protocols- Inter and Intra Routing Protocol- Autonomous Systems – Routing Table - Interior Gateway Protocols – Exterior Gateway Protocols – Routing in Internet. Group Management – IGMP Message – IGMP Operation – Process to Process Communication.

UNIT IV UDP OPERATION **12 HOURS**

UDP Operation – TCP Services conjunction control - Flow Control – Multicast Routing – Multicast Routing Protocols. BOOTP - DHCP – Address Discovery and Binding. DNS – Name Space – DNS in Internet – Resolution – Resource Records. TELNET.

UNIT V REMOTE LOGIN **12 HOURS**

Remote Login - FTP – SMTP – SNMP. IP over ATM Wan – Cells – Routing the Cells. Mobile IP: Addressing – Agents – Agent discovery – Registration – Data Transfer – VPN.

TOTAL: 60 HOURS

TEXT BOOKS:

1. Behrouz A. Forouzan, (2010). *TCP/IP Protocol Suite*, 4th Edition. New Delhi: Tata McGraw Hill Publication.
2. Douglas E. Comer, (2000). *Internetworking With TCP/IP, Vol 1: Principles Protocols and Architecture*, 4th Edition. New Delhi: Pearson Education.

REFERENCE BOOKS:

1. William Stallings, (1997). *Data and Computer Communication*, 5th Edition. New Delhi: Prentice Hall of India.

WEBSITE LINKS:

1. en.wikipedia.org/wiki/Internet_protocol_suite
2. http://docwiki.cisco.com/wiki/Introduction_to_WAN_Technologies
3. www.yale.edu/pclt/COMM/TCPIP.HTM
4. www.w3schools.com/tcpip/default.asp

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	1	-	1	-	-	-	1	1	1	-	-	-	-	-	-
CO2	3	-	-	1	-	-	-	-	-	-	1	-	-	-	-	2	-
CO3	3	-	1	-	-	1	-	1	1	-	-	-	-	-	-	-	3
CO4	3	-	1	1	-	-	-	2	2	-	-	-	-	-	-	-	-
CO5	3	-	3	2	3	2	-	3	3	-	-	-	-	-	-	-	-
Average	**3**	**-**	**1.5**	**1.3**	**2**	**1.5**	**-**	**2**	**1.8**	**1**	**1**	**-**	**-**	**-**	**-**	**2**	**3**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

24CAP205S **SOFTWARE DESIGN USING UML** **5H-3C**

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To integrate UML diagrams into different phases of the software development life cycle, including requirements analysis, design, implementation, testing, deployment, and maintenance.
- To practice modeling complex software systems using multiple UML diagrams, demonstrating relationships and interactions between components.
- To enhance communication among project stakeholders (e.g., developers, clients, testers) through clear and precise UML diagrams.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Summarize the fundamentals of object modelling	Understand
CO2	Demonstrate conceptual classes within a domain, distinguishing them from other types of classes	Understand
CO3	Analyze the dynamic and architectural modelling UML diagrams	Analyze
CO4	Illustrate the various architectural design elements, interface design elements, component-level diagram element	Understand
CO5	Compare and contrast traditional software development models (e.g., Waterfall) with Agile models	Analyze

UNIT I UNIFIED PROCESS AND USECASE DIAGRAMS **12 HOURS**

Introduction to OOAD with OO Basics - Unified Process – UML diagrams – Use Case –Case study – the Next Gen POS system, Inception -Use case Modelling – Relating Use cases – include, extend and generalization – When to use Use-cases.

UNIT II STATIC UML DIAGRAMS **12 HOURS**

Class Diagram— Elaboration – Domain Model – Finding conceptual classes and description classes – Associations – Attributes – Domain model refinement – Finding conceptual class Hierarchies – Aggregation and Composition - Relationship between sequence diagrams and use cases – When to use Class Diagrams.

UNIT III DYNAMIC AND ARCHITECTURAL MODELLING UML DIAGRAMS **12 HOURS**

Dynamic Diagrams – UML interaction diagrams - System sequence diagram – Collaboration diagram –

When to use Communication Diagrams - State machine diagram and Modelling –When to use State Diagrams - Activity diagram – When to use activity diagrams Implementation Diagrams - UML package diagram - When to use package diagrams - Component and Deployment Diagrams – When to use Component and Deployment diagrams.

UNIT IV DESIGN PATTERNS AND ELEMENTS **12 HOURS**

Design Patterns: GRASP-Designing objects with responsibilities –Applying GoF design patterns – Creational Patterns, Structural Patterns, Behavioral Patterns, Design Elements: 54 Architectural design elements - Interface design elements - Component level diagram elements - Deployment level design elements, Mapping design to code.

UNIT V – AGILE METHODOLOGIES **12 HOURS**

Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values

TOTAL: 60 HOURS

TEXT BOOKS:

1. Craig Larman, (2005). *Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development*, Third Edition, Pearson Education.
2. Ali Bahrami, (1999). *Object Oriented Systems Development*, McGraw Hill International Edition.

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	-	-	3	-	-	-	-	3	-
CO2	3	-	-	1	2	-	-	-	1	-	-	-	-	-	-	-	-
CO3	3	-	3	2	3	2	-	1	3	-	2	-	-	-	-	-	2
CO4	3	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
CO5	3	-	3	2	3	2	-	1	3	-	-	-	-	-	-	-	1
Average	**3**	**-**	**3**	**1.7**	**2.7**	**1.7**	**-**	**1**	**2.3**	**-**	**2.5**	**-**	**-**	**-**	**-**	**3**	**1.5**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester II

24CAP205W **SEMANTIC WEB AND ONTOLOGIES** **5H-3C**

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To represent data from a chosen problem in XML with appropriate semantic tags obtained or derived from the ontology.
- To understand the semantic relationships among these data elements using Resource.
- To design and implement a web services application that "discovers" the data and/or other Description Framework (RDF).

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Analyze fundamental concepts, advantages and limits of the semantic web	Analyze
CO2	Demonstrate the semantic relationships among these data elements using Resource	Understand
CO3	Explain the RDF framework and associated technologies for developing semantic web	Understand
CO4	Analyze the various languages and properties of Web Ontologies	Analyze
CO5	Summarize semantic Web Tools like Jena and SPARL for developing architecture for semantic web	Understand

UNIT I INTRODUCTION **12 HOURS**

Introduction to the Syntactic web and Semantic Web – Evolution of the Web – The visual and syntactic web – Levels of Semantics – Metadata for web information - The semantic web architecture and technologies –Contrasting Semantic with Conventional Technologies –Semantic Modeling - Potential of semantic web solutions and challenges of adoption.

UNIT II ONTOLOGICAL ENGINEERING **12 HOURS**

Ontologies – Taxonomies –Topic Maps – Classifying Ontologies – Terminological aspects: concepts, terms, relations between them – Complex Objects –Subclasses and Sub-properties definitions – Upper Ontologies – Quality – Uses - Types of terminological resources for ontology building – Methods and methodologies for building ontologies – Multilingual Ontologies -Ontology Development process and Life cycle – Methods for Ontology Learning – Ontology Evolution – Versioning.

UNIT III STRUCTURING AND DESCRIBING WEB RESOURCES **12 HOURS**

Structured Web Documents - XML – Structuring – Namespaces – Addressing – Querying – Processing - RDF – RDF Data Model – Serialization Formats- RDF Vocabulary –Inferencing - RDFS – basic Idea – Classes – Properties- Utility Properties – RDFS Modeling for Combinations and Patterns- Transitivity.

UNIT IV WEB ONTOLOGY LANGUAGE **12 HOURS**

OWL – Sub-Languages – Basic Notions -Classes- Defining and Using Properties – Domain and Range – Describing Properties - Data Types – Counting and Sets- Negative Property Assertions – Advanced Class Description – Equivalence – Owl Logic – Knowledge Graph.

UNIT V SEMANTIC WEB TOOLS AND APPLICATIONS **12 HOURS**

Development Tools for Semantic Web – Jena Framework – SPARL –Querying semantic web - Semantic Wikis - Semantic Web Services – Modeling and aggregating social network data - Ontological representation of social relationships, Aggregating and reasoning with social network data Understand semantic web basics, architecture and technologies

TOTAL: 60 HOURS

TEXT BOOKS:

1. Grigoris Antoniou, Frank van Harmelen, (2012). 3rd Edition, *A Semantic Web Primer*,.,MIT Press, USA.
2. Liyang Yu, (2011). *A Developer's Guide to the Semantic Web*, First Edition ,Springer.
3. John Hebeler, Matthew Fisher, Ryan Blace and Andrew Perez-Lopez, (2009). *Semantic Web Programming*", First Edition Wiley.

REFERENCE BOOKS:

1. Robert M. Colomb, (2007). *Ontology and the Semantic Web*, *Volume 156 Frontiers in Artificial Intelligence and Applications (Frontier in Artificial Intelligence and Applications),* IOS Press.
2. Dean Allemang and James Hendler, (2011). *Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL*, Second Edition, Morgan Kaufmann.

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	3	3	3	2	-	2	3	-	-	-	-	-	-	-	1
CO2	3	-	-	-	-	-	-	-	-	1	1	-	-	-	-	1	-
CO3	3	-	1	-	2	-	-	-	1	-	-	-	-	-	-	-	2
CO4	3	-	3	3	3	2	-	2	3	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-
Average	**3**	**-**	**2.3**	**3**	**2.7**	**1.7**	**-**	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**1.5**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

24CAP204DSE1 **ETHICS IN DATA SCIENCE** **5H-3C**

Instruction Hours / Week: L:5 T:0 P:0 **Marks:** Internal**:40** External**:60** Total**:100**

End Semester Exam:3Hours

PREREQUISITE:

- Statistics Concepts, Research Fundamentals

COURSE OBJECTIVES (CO):

- To establish guidelines for the ethical development and deployment of AI and machine learning models.
- To evaluate the potential social impact of data science projects and initiatives, considering broader societal implications.
- To develop and adopt ethical decision frameworks and guidelines specific to data science, guiding ethical decision-making throughout the project lifecycle.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Understand Philosophical frameworks for assessing fairness.	Understand
CO2	Get knowledge on Data ownership, privacy and anonymity.	Understand
CO3	Identify sources of bias in data, algorithms, and models used in data science projects.	Analyze
CO4	Articulate the importance of transparency in data science practices, including algorithmic transparency, model interpretability, and explain ability of decisions.	Examine
CO5	Demonstrate ethical leadership and responsibility in data science projects, advocating for ethical practices and policies within organizations.	Create

UNIT I INTRODUCTION AND PHILOSOPHICAL FRAMEWORKS FOR ASSESSING FAIRNESS **12 HOURS**

Foundations of ethics - early theories of fairness (Utilitarianism etc.) - contemporary theories of fairness - significance of ethics in data science - ethics vs. law/compliance/public relations - cultural relativism - “professional” ethics in data science - individuals vs. collectives.

UNIT II RESEARCH ETHICS **12 HOURS**

Data driven research, methods of collection of data - different types of data: qualitative and quantitative - overview of ethical issues in data-driven organizations - doing ethical data analysis - responsible use of research data - plagiarism - fake data and fabrication of data - creation of data base.

UNIT III DATA OWNERSHIP, PRIVACY, ANONYMITY AND ALGORITHMIC FAIRNESS **12 HOURS**

Understanding the difference between data ownership - data privacy and data anonymity - under- standing the idea behind data surveillance - data privacy vs. data security. Discrimination and algorithms- obscure and unintentional bias displayed by the algorithms - ethics of data scraping and storage- Mosaic data- found data- and designed data.

UNIT IV POLICIES ON DATA PROTECTION **12 HOURS**

EU's general data protection rules - GDPR - digital India policy - personal data protection bill - 2019 -PDP Bill- ethical issues on data privacy in context with India - case studies.

UNIT V RESPONSIBLE AI AND RED TEAMING ON LLM & CASE STUDY **12 HOURS**

Various dimensions of Responsible AI - Dimensions of Ethical AI - Bias Mitigation Techniques; Constitutional AI: Rulesof Constitutional AI - How to create Constitutional AI complaint system - Model fine tuning for Constitutional AI.What are the vulnerabilities - How to attack those problems by Red Teaming.

TOTAL: 60 HOURS

TEXT BOOKS:

1 O'Keefe, K., & O'Brien, D. *Ethical Data and Information Management: Concepts, Tools, and Methods*.

2 Loukides, M., Mason, H., & Patil, D. J. *Data Science Ethics*.

3 Boatman, A. A., & House, E. N. *Ethics and Data Science*.

REFERENCE BOOKS:

1 Priest, S., & Goodwin, J. (n.d.). *Ethics and Practice in Science Communication*.

2 Franks, B. (n.d.). *The Ethical Data Scientist*.

WEBSITES:

1 https://www.analyticsvidhya.com/blog/2022/02/ethics-in-data-science-and-proper-privacy-and-usage-of-data/

2 https://online.maryville.edu/online-masters-degrees/data-science/careers/data-science-ethics-issues-and-strategies/

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	1	3	1	2	-	-	-	-	1	-
CO2	3	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
CO3	3	-	-	-	2	1	-	1	2	-	-	-	-	-	-	-	1
CO4	3	-	3	2	3	2	-	2	-	-	-	-	-	-	-	-	-
CO5	3	-	3	3	3	2	-	1	3	-	-	-	-	-	-	-	-
Average	3	0	3	2.5	2.7	1.7	0	1.3	2.5	1	2	0	0	0	0	1	1

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester II

24CAP204DSE2 **COMPUTER VISION** **5H-3C**

Instruction Hours / Week: L:5 T:0 P:0 **Marks:** Internal**:40** External**:60** Total**:100**

End Semester Exam:3Hours

PREREQUISITE:

- Image Processing Techniques fundamentals

COURSE OBJECTIVES (CO):

- To Learn about basic image operations such as filtering, edge detection, and image enhancement techniques.
- To Understand techniques for pixel-level classification to segment images into different regions based on semantic meaning.
- To Explore methods for estimating depth from images and reconstructing 3D scenes using stereo vision or depth sensors.

COURSE OUTCOMES (COS):

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

COs	Course Outcomes	Blooms Level
CO1	Understand what techniques are available to process the image.	Understand
CO2	Analyze the image and extract required features.	Analyze
CO3	Evaluate computer vision solves real world problems.	Evaluate
CO4	Learn principles and methods for estimating depth from images and reconstructing 3D scenes using stereo vision and depth sensors.	Apply
CO5	Develop a mindset for exploring new advancements and research directions in computer vision, contributing to innovation in the field.	Apply

UNIT I: IMAGE PROCESSING TECHNIQUES **12 HOURS**

Introduction to image processing: What is image processing? - Understanding about types of image processing-Visualization, Recognition, Sharpening & Restoration, Pattern Recognition, Retrieval; Image Transformation: Image Enhancement Techniques: Histogram Equalization, Contrast Stretching, Adaptive Enhancement - Image Restoration Methods: Deblurring, Denoising, Inpainting - Linear Filtering: Convolution, Gaussian Filtering, Edge Detection - Independent Component Analysis (ICA) - Pixelation and Its Applications; Image Generation Technique: Procedural Image Generation: Fractal Generation, Noise-based Generation - Generative Adversarial Networks (GANs) for Image Generation: Introduction to GANs-Understanding the architecture and training process of generative adversarial networks, Implementing GANs for generating realistic images, including applications in image-to-image translation and style transfer. - Applications of Image Generation Techniques: Data Augmentation, Creative Applications.

UNIT II: FEATURE EXTRACTION AND IMAGE ANALYSIS **12 HOURS**

Feature Detection: Introduction to feature detection - Object recognition techniques (key point detection, edge detection) - Image segmentation algorithms (region growing, thresholding, etc.) - Frequency domain processing (Fourier transform, frequency filtering) - Feature extraction methods (SIFT, SURF); Object Description: Introduction to fundamentals of moving object detection - Moving object description techniques (optical flow, background subtraction) - Camera geometry for object description (camera calibration, pose estimation).

UNIT III: MACHINE LEARNING FOR COMPUTER VISION **12 HOURS**

Image Classification: Introduction to machine learning for computer vision - Image classification models (CNNs, transfer learning) - Object detection with machine learning (YOLO, SSD) - Labeling images for machine learning (annotation tools, data augmentation).

UNIT IV: 3D COMPUTER VISION **12 HOURS**

Depth Perception: Comparison of 2D and 3D computer vision - Real-world applications and trends in 3D computer vision - Classification of 3D data (point clouds, meshes).

UNIT V: ADVANCED CV AND FUTURE TRENDS **12 HOURS**

Advanced Computer Vision Applications: Brain Tumor Detection - Integrating Computer Vision in Autonomous Driving Systems - Computer Vision Applications in the Food Industry;Object Detection and Recognition: Visual Tracking - Semantic Segmentation - Human Recognition.

TOTAL: 60 HOURS

TEXT BOOKS:

1 Ayyadevara, V. K., & Reddy, Y. (2020). *Modern Computer Vision with PyTorch*. Packt Publishing.

2 Cyganek, B. (2009). *An Introduction to 3D Computer Vision Techniques and Algorithms* (1st ed.). John Wiley & Sons Inc.

REFERENCE BOOKS:

1 Davies, E. R. *Computer Vision: Principles, Algorithms, Applications, Learning*.

2 Prince, S. J. D. *Computer Vision: Models, Learning, and Inference*.

WEBSITES:

1 https://www.ibm.com/topics/computer-vision

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	3	3	3	-	-	-	-	-	2	1	2	-	-	-	-	-
Average	3	3	3	3	2	2	0	0	0	2	1	2	0	0	0	0	0

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester II

24CAP204DSE3 NATURAL LANGUAGE PROCESSING 5H-3C

Instruction Hours / Week: L:5 T:0 P:0 **Marks:** Internal**:40** External**:60** Total**:100**

End Semester Exam:3Hours

PREREQUISITE:

- Machine learning fundamentals

COURSE OBJECTIVES (CO):

- To Understand the basic concepts, principles, and terminology of natural language processing.
- To Learn techniques for cleaning and preprocessing text data, including tokenization, normalization, and stemming/lemmatization.
- To Explore the application of statistical models and machine learning algorithms to NLP tasks such as text classification, named entity recognition, and sentiment analysis.

COURSE OUTCOMES (COS):

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

COs	Course Outcomes	Blooms Level
CO1	Understand the purpose of NLP and how to use it in real world applications with example.	Understand
CO2	Solve a classification problem.	Examining
CO3	Understand how deep learning is applied for NLP.	Understand
CO4	Transfer learning concepts for reusability of knowledge.	Apply
CO5	Understand the applications of voice recognition system.	Understand

UNIT I NLP NEED & REAL-WORLD APPLICATIONS **12 HOURS**

What is NLP and its components? - Phases of NLP - Challenges of natural language - Applications of NLP - Industries using NLP - NLP programming languages - NLP libraries and Development environments - Use of AI in NLP - Basic Text Processing and Linguistic Concepts: Tokenization - Stemming - Lemmatization - Part-of-Speech Tagging.

UNIT II TEXT CLASSIFICATION **12 HOURS**

Benefits of Text Classification - Types of Text classification - Challenges in text classification - Applications of text classification

UNIT III DEEP LEARNING FOR NLP **12 HOURS**

Convolutional Neural Networks (CNNs) for NLP - Recurrent Neural Networks (RNNs) for NLP - Recursive Neural Networks - Hybrid Models for NLP

UNIT IV TRANSFER LEARNING FOR NLP **12 HOURS**

Benefits of Transfer Learning for NLP - Fine Tuning techniques - Fine-Tune BERT for Spam

Classification

UNIT V VOICE RECOGNITION **12 HOURS**

Basics of Voice Recognition: Difference between speech and voice recognition - Use of NLP in voice recognition and transformation: Speech recognition using NLP models (HMM, DTW) - Acoustic modelling - Error correction in voice recognition.

TOTAL: 60 HOURS

TEXT BOOKS:

1 Vajjala, S., Majumder, B., Gupta, A., & Surana, H. (2020). *Practical Natural Language Processing*. Shroff/O'Reilly.

2 Kamath, U., Liu, J., & Whitaker, J. (2019). *Deep Learning for NLP and Speech Recognition* (1st ed.). Springer.

REFERENCE BOOKS:

1 Allen, J. (n.d.). *Natural Language Understanding*.

2 Indurkhya, N., & Damerau, F. J. (Eds.). (n.d.). *Handbook of Natural Language Processing*.

WEBSITES:

1 https://www.ibm.com/topics/natural-language-processing

2 https://www.oracle.com/in/artificial-intelligence/what-is-natural-language-processing/

3 https://www.techtarget.com/searchenterpriseai/definition/natural-language-processing-NLP

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
CO2	3	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO3	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
CO4	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO5	3	2	1	-	-	-	1	-	-	-	-	-	-	-	-	-	1
Average	2.4	1.4	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

24CAP205DSE1 APPLICATION ARCHITECTURE AND DEPLOYMENT 5H-3C

Instruction Hours / Week: L:5 T:0 P:0 **Marks:** Internal**:40** External**:60** Total**:100**

End Semester Exam:3Hours

PREREQUISITE:

- Machine learning fundamentals, Software engineering basics

COURSE OBJECTIVES (CO):

- To Design and document software architectures for complex systems.
- To Develop automated deployment pipelines for continuous integration and delivery.
- To Implement practices for maintaining system reliability, availability, and security in production environments.

COURSE OUTCOMES (COS):

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

COs	Course Outcomes	Blooms Level
CO1	Understand the differences between monolithic and microservices architecture and their respective advantages and disadvantages in AI applications.	Understand
CO2	The Kubernetes and how it can be used to manage and deploy AI models in a production environment.	Analyze
CO3	Understand application programming interfaces (APIs) and their role in integrating AI models into larger systems.	Understand
CO4	MLOps and how it can be used to streamline the machine learning lifecycle, from data preparation to model deployment and monitoring.	Apply
CO5	Effectively communicate emerging technologies, tools, and methodologies in application architecture and deployment.	Evaluate

UNIT I MONOLITHIC VS MICROSERVICES 12 HOURS

Introduction to Software Architecture and its types - What is Monolithic Architecture and its Importance - Characteristics of Monotithic Architecture - Limitations of Monolithic Architecture - What are Microservices - Working of Microservices - Main Components of Microservices Architecture - Advantages of Microservices - Monolithic vs Microservices - Real World Example of Microservices - Challenges in Microservices.

UNIT II APPLICATION PROGRAMMING INTERFACE 12 HOURS

What is an API - How do an API Work - WEB APIs - LOCAL APIs - PROGRAM APIs - SOAP, REST API - What are REST APIs - HTTP methods (GET, POST, PUT, DELETE) - Status Codes and URI

structure - SOAP vs REST - What is API testing - Types of Testing - Tools for API Testing - Authentication Mechanisms - Authorization Mechanisms - Role Based Access Control (RBAC)

UNIT III CONTAINERS - AN INTRODUCTION **12 HOURS**

What is Virtualization - Virtualization in Cloud Computing - Introduction to containerization - Container Lifecycle - Virtualization vs Containerization - Container Security - Serverless Containers - Introduction to Docker - Docker Architecture - Components of Docker - Concept of Docker Images - Docker Commands - Advantages of Docker - Introduction to Orchestration tools

UNIT IV KUBERNETES - AN INTRODUCTION **12 HOURS**

What is Kubernetes (K8s) - Why Kubernetes and not only docker - Kubernetes Components - Node - Control Plane - Networking in Kubernetes - Kubernetes Resources - Pod, Deployment, Service, Volume, Namespace, node, cluster - Storage - Security - Monitoring, Logging, Scaling - Writing YAML files.

UNIT V ML OPERATIONS **12 HOURS**

Introduction to ML Operations - What is SDLC - Stages of SDLC - Waterfall Model - Agile Model - Iterative Model - Importance of Each Models - Model Training - Model Deployment.

TOTAL: 60 HOURS

TEXT BOOKS:

1 Surovich, S., & Boorshtein, M. (2021). *Kubernetes and Docker*. Packt Publishing.

2 Treveil, M., Omont, N., & Stenac, C. (2020). *Introducing MLOps: How to Scale Machine Learning in the Enterprise*. (Grayscale Indian Edition). Shroff/O'Reilly.

REFERENCE BOOKS:

1 Libutti, L. R. *Systems Application Architecture* (1st ed.).

2 Shaw, M., & Garlan, D. (1996). *Software Architecture: Perspectives on an Emerging Discipline*. Prentice Hall.

WEBSITES:

1 https://www.ibm.com/blog/four-architecture-choices-for-application-development/

2 https://docs.oracle.com/cd/E19199-01/817-5759/dep_architect.html

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	3	2	-	2	-	1	2	1	-	-	-	-	-	1	-
CO2	3	-	3	-	3	2	-	-	2	-	-	-	-	-	-	-	-
CO3	3	-	3	3	2	2	-	-	1	-	1	-	-	-	-	-	2
CO4	3	-	3	3	2	2	-	-	2	-	-	-	-	-	-	-	-
CO5	3	2	3	3	3	2	2	1	-	-	1	-	-	-	-	-	2
Average	**3**	**2**	**3**	**2.8**	**2.5**	**2**	**2**	**1**	**1.8**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**2**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester II

24CAP205DSE2 **SECURITY FOR DATA SCIENCE** **5H-3C**

Instruction Hours / Week: L:5 T:0 P:0 **Marks:** Internal**:40** External**:60** Total**:100**

End Semester Exam:3Hours

PREREQUISITE:

- Network Security fundamentals

COURSE OBJECTIVES (CO):

- Design and implement secure data collection, storage, and processing workflows.
- Apply encryption and anonymization techniques to protect sensitive data.
- Conduct security risk assessments and implement mitigation strategies.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Understand the Fundamentals of Cyber Security.	Understand
CO2	Implement Secure Data Handling Practices	Apply
CO3	Analyse Security Risks in Data Science Projects	Analyze
CO4	Develop Threat Detection and Response Strategies.	Evaluate
CO5	Design Ethical and Privacy-Preserving Data Science Solutions.	Evaluate

UNIT I INTRODUCTION TO CYBER SECURITY AND DATA SCIENCE **12 HOURS**

Overview of Cyber Security and Data Science - Definitions and Concepts - Intersection of Cyber Security and Data Science - Cyber Threat Landscape - Types of Cyber Threats - Attack Vectors and Techniques - Impact of Cyber Attacks on Data Science Processes - Foundations of Data Science - Data Collection and Sources - Data Storage and Management - Data Processing and Analysis Techniques.

UNIT II FOUNDATIONS OF CYBER SECURITY **12 HOURS**

Principles of Cyber Security - Confidentiality, Integrity, and Availability (CIA) - Authentication and Authorization - Encryption and Cryptography - Secure Data Handling - Data Classification and Sensitivity - Data Masking and Anonymization - Secure Data Transfer and Sharing - Data Privacy and Compliance - Privacy Regulations (GDPR, HIPAA) - Data Governance and Compliance Frameworks - Ethical Considerations in Data Science and Cyber Security.

UNIT III DATA PRIVACY AND PROTECTION **12 HOURS**

Data Privacy and Protection -Secure Data Sharing and Transfer - Secure File Transfer Protocols - Secure Data Exchange Platforms - Securing Data Collection Systems - Best Practices for Secure Data Storage - Cloud Security and Data Privacy - Secure Data Transfer and Backup Strategies - Data Retention Policies and Compliance.

UNIT IV THREAT DETECTION AND INCIDENT RESPONSE **12 HOURS**

Threat Detection and Incident Response - Security Information and Event Management (SIEM) - Log Management and Analysis - Real-time Threat Detection - Incident Response Frameworks - Preparation, Identification, Containment, Eradication, Recovery - Forensic Analysis Techniques - Machine Learning for Cyber Security - Threat Prediction and Classification - Behavioural Analysis and User Profiling.

UNIT V ADVANCED TOPICS IN CYBER SECURITY FOR DATA SCIENCE **12 HOURS**

Advanced Topics in Cyber Security for Data Science - Adversarial Machine Learning - Evasion Attacks - Defence Mechanisms - Secure Machine Learning Models - Privacy-Preserving Machine Learning - Federated Learning - Ethical and Legal Considerations - Bias and Fairness in Cyber Security - Ethical Hacking and Responsible Disclosure.

TOTAL: 60 HOURS

TEXT BOOKS:

1 Stallings, W. (2019). *Effective Cybersecurity: A Guide to Using Best Practices and Standards*. Addison-Wesley Professional.

2 Shabtai, A., Elovici, Y., & Rokach, L. (2012). *A Survey of Data Leakage Detection and Prevention Solutions*. Springer.

3 Bishop, M. (2005). *Introduction to Computer Security*. Addison-Wesley.

REFERENCE BOOKS:

1 Foster, I., & Gawande, A. (2017). *Big Data and Privacy: Understanding and Deploying Secure Data Science Solutions*. Chapman and Hall/CRC.

2 Zhang, N., & Ghorbani, A. A. (2013). *Privacy and Security for Cloud Computing*. Springer.

WEBSITES:

1 https://www.knowledgehut.com/blog/data-science/data-science-in-cyber-security

2 https://hdsr.mitpress.mit.edu/pub/koyzu1te/release/1

CO,PO,PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	3	3	2	2	-	1	2	-	2	-	-	-	-	2	-
CO2	3	-	3	2	2	2	-	1	2	1	-	-	-	-	-	-	-
CO3	3	-	3	2	2	2	-	1	2	-	-	-	-	1	-	-	3
CO4	3	-	2	2	2	2	-	1	2	-	-	-	-	-	-	-	-
CO5	3	-	3	3	2	2	-	1	2	-	-	-	-	-	-	-	3
Average	**3**	**-**	**2.8**	**2.4**	**2**	**2**	**-**	**1**	**2**	**1**	**2**	**-**	**-**	**1**	**-**	**2**	**3**

1-Low, 2-Medium, 3-Strong; '-' - No Correlation

24CAP304D **INTRODUCTION TO NOSQL DATABASE** **5H-3C**

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To discuss how NoSQL databases are designed to handle large volumes of structured, semi-structured, and unstructured data more efficiently than traditional SQL databases.
- To ensure high availability and fault tolerance, often through distributed architecture and data replication strategies.
- To provide examples of typical use cases where NoSQL databases excel, such as content management systems, IoT data storage, real-time analytics, and large-scale e-commerce platforms.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Compare different types of NoSQL Databases	Analyze
CO2	Compare and contrast RDBMS with different NoSQL databases	Analyze
CO3	Analyze the detailed performance tune of Document-oriented NoSQL databases.	Analyze
CO4	Summarize the Column-oriented NoSQL Databases	Understand
CO5	Analyze performance tune of Key-Value Pair NoSQL databases	Analyze

UNIT I OVERVIEW OF NOSQL **12 HOURS**

Overview and History of NoSQL Databases. Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL,Key Points**.**

UNIT II COMPARISION OF RDBMS **12 HOURS**

Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases. Replication and sharding, MapReduce on databases. Distribution Models, Single Server, Sharding, Master- Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.

UNIT III DATABASE AND WEB ANALYTICS **12 HOURS**

NoSQL Key/Value databases using MongoDB, Document Databases, Document oriented Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure.

UNIT IV COLUMN ORIENTED NOSQL **12 HOURS**

Column- oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store Features, Consistency,Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging.

UNIT V KEY VALUES **12 HOURS**

NoSQL Key/Value databases using Riak, Key-Value Databases,Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases,Storing Session Information, User Profiles, Preferences, Shopping Cart Data,Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets. Graph NoSQL databases using Neo4, NoSQL database development tools and programming languages, Graph Databases, Graph Database. Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases.

TOTAL: 60 HOURS

TEXT BOOKS:

1. Sadalage, P. & Fowler, (2019). *NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence*, 1st Edition, Wiley Publications.

WEBSITE LINKS:

1. https://www.ibm.com/cloud/learn/nosql-databases
2. https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp
3. https://www.geeksforgeeks.org/introduction-to-nosql/
4. https://www.javatpoint.com/nosql-database

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	3	2	3	2	-	-	3	1	-	-	-	-	-	2	-
CO2	3	-	3	2	3	3	-	1	3	-	-	-	-	-	-	-	-
CO3	3	-	3	2	3	2	-	-	2	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
CO5	3	-	3	2	3	3	-	1	2	-	-	-	-	-	-	-	2
Average	**3**	**-**	**3**	**2**	**3**	**2.5**	**-**	**1**	**2.5**	**1**	**1**	**-**	**-**	**-**	**-**	**2**	**2**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester III

23CAP304N **SOFTWARE DEFINED NETWORK** **5H-3C**

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To learn the fundamentals of software defined networks.
- To understand the separation of the data plane and the control plane.
- To study about the SDN Programming.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Summarize the fundamental concepts of Software defined network.	Understand
CO2	Analyze the protocols and the controllers.	Analyze
CO3	Explain the Networking technique for Application Development.	Understand
CO4	Analyze and Understand the SDN applications in other environments.	Analyze
CO5	Analyze the Future of SDN(5G).	Analyze

UNIT I INTRODUCING SDN **12 HOURS**

History of Software Defined Networking (SDN) – Modern Data Center – Traditional Switch Architecture – Why SDN – Evolution of SDN – How SDN Works – Centralized and Distributed Control and Date Planes.

UNIT II SDN ABSTRACTIONS **12 HOURS**

How SDN Works - The Openflow Protocol - SDN Controllers: Introduction - General Concepts - VMware - Nicira - VMware/Nicira - OpenFlow-Related - Mininet - NOX/POX - Trema - Ryu - Big Switch Networks/Floodlight - Layer 3 Centric - Plexxi - Cisco OnePK.

UNIT III PROGRAMMING SDN'S **12 HOURS**

Network Programmability - Network Function Virtualization - NetApp Development, Network Slicing

UNIT IV SDN APPLICATIONS AND USE CASES **12 HOURS**

SDN in the Data Center - SDN in Other Environments - SDN Applications - SDN Use Cases - The Open Network Operating System 3.

UNIT V SDN'S FUTURE AND PERSPECTIVES **12 HOURS**

SDN Open Source - SDN Futures - Final Thoughts and Conclusions

TOTAL: 60 HOURS

TEXT BOOKS:

1. Paul Goransson and Chuck Black, (2014). *Software Defined Networks: A Comprehensive Approach*, Morgan Kaufmann Publications.
2. Thomas D. Nadeau & Ken Gray, (2013). *SDN - Software Defined Networks*, O'Reilly Publications.
3. Siamak Azodolmolky, (2013). *Software Defined Networking with Open Flow*, Packt Publishing.
4. Kreutz, Diego, (2015). *Software-defined networking: A comprehensive survey*, Proceedings of the IEEE 103.1.
5. Nunes, Bruno AA, (2014). *A survey of software-defined networking: Past, present, and future of programmable networks Communications Surveys & Tutorials*, IEEE 16.3.

REFERENCE BOOKS:

1. Lantz, Bob, Brandon Heller, and Nick McKeown, (2010). *A network in a laptop: rapid prototyping for software-defined networks*, Proceedings of the 9th ACM SIGCOMM Workshop on Hot Topics in Networks, ACM.
2. Monsanto, Christopher, (2013). *Composing software defined networks*, Presented as part of the 10th USENIX Symposium on Networked Systems Design and Implementation (NSDI 13).

WEBSITE LINKS

1. https://www.geeksforgeeks.org/software-defined-

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-
CO2	3	-	3	2	3	2	-	2	-	-	-	-	-	-	-	1	2
CO3	3	-	-	2	-	1	-	-	-	-	-	-	-	-	-	-	3
CO4	3	-	-	-	3	2	-	2	1	-	1	-	-	-	-	-	-
CO5	3	-	3	2	3	2	-	1	1	-	-	-	-	-	-	-	-
Average	**3**	**-**	**3**	**2**	**3**	**1.8**	**-**	**1.7**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**2.5**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester III

24CAP304S SOFTWARE TESTING AND QUALITY ASSURANCE 5H-3C

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To implement processes and methodologies to improve the overall quality of the software product.
- To measure and evaluate the performance metrics of the software, such as response times, throughput, and scalability, to ensure it meets performance requirements.
- To ensure that the software complies with relevant regulatory, legal, and industry standards.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Analyze the testing techniques to deliver a product free from bugs	Analyze
CO2	Explain Path Testing, Path Sensitizing Basics	Understand
CO3	Illustrate the effective transaction flow and data flow testing	Understand
CO4	Analyze the Integration of Hybrid Metrics for Comprehensive Assessment	Analyze
CO5	Demonstrate the Proficiency in Project Management Strategies and Risk Management Integration.	Understand

UNIT I – INTRODUCTION TO TESTING **12 HOURS**

Introduction: Purpose of Testing – Dichotomies - Model for Testing – consequences of bugs- Taxonomy for bugs

UNIT II – FLOW GRAPHS AND PATH TESTING **12 HOURS**

Flow/Graphs and Path Testing: Path testing basics-predicates, path predicates and Achievable paths – Path sensitizing– path instrumentation-implementation and application of path testing

UNIT III INTRODUCTION TO FLOW TESTING **12 HOURS**

Transaction flow testing: – Transaction flow - Transaction flow testing techniques – implementation comments – testability tips -Data flow testing basics-Data flow testing strategies.

UNIT IV – DOMAINS AND PATHS **12 HOURS**

Domains and paths-Nice Domains and Ugly Domains-Domain Testing-Domains and interface testing-Domains and testability-Metrics-Linguistic metrics-structural metrics- Hybrid metrics- metrics implementations-Testability tips

UNIT V – RISK ANALYSIS **12 HOURS**

Risk Analysis: Benefits of Risk analysis – Project Management Strategies and Risk – MITs riskAnalysis – MITs Ranking Criteria - Using Risk Ranking in Forensics –Test estimation process- MIT totals worksheet-Sizing worksheet

TOTAL: 60 HOURS

TEXT BOOKS:

1. Boris Beizer, (2003). *Software Testing Techniques*, II Edition., Dream Tech India, New Delhi.
2. Marnie L Hutcheson, (2003). *Software testing fundamentals*, 1st Edition, Wiley, DreamTech India, New Delhi.

REFERENCE BOOKS:

1. Burnstein, (2003). *Practical Software Testing*, Springer International Edition.
2. Dorothy Graham,Rex Black, (2011). *Foundations of Software Testing - ISTQBCertification*, 3rd Edition, Cengage Learning.
3. R.Rajani, and P.P.Oak, (2004). *Software Testing*, Tata Mcgraw Hill, New Delhi.

WEBSITE LINKS:

1. http://my.safaribooksonline.com
2. http://www2.sas.com
3. http://www.softwaretesting fundamentals.com
4. www.cs.cmu.edu
5. www.softwaretesting management.con
6. http://www.java2novice.com/junit-examples/test-list-objects/

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	3	2	3	1	-	1	2	-	-	-	-	-	-	1	-
CO2	3	-	2	-	-	-	-	-	-	1	2	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1
CO4	3	-	3	2	3	1	-	1	2	-	-	-	1	2	-	-	-
CO5	3	-	-	1	2	1	-	1	-	-	1	-	-	-	-	-	-
Average	**3**	**-**	**2.7**	**1.7**	**2.7**	**1**	**-**	**1**	**1.7**	**1**	**1.5**	**-**	**1**	**2**	**-**	**1**	**1**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester III

24CAP304W **FULL STACK WEB DEVELOPMENT** **5H-3C**

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To gain proficiency in developing both client-side (front-end) and server-side (back-end) components of web applications.
- To develop robust back-end services and APIs using server-side technologies
- To implement database solutions (SQL or NoSQL) and manage data storage, retrieval, and manipulation efficiently to support application functionality and performance requirements.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Summarize the introduction about CSS and JavaScript	Understand
CO2	Analyze the Server side programming with NodeJs	Analyze
CO3	Demonstrate the MongoDB connection with NodeJs	Understand
CO4	Illustrate to create interactive and responsive user interfaces	Understand
CO5	Analyze the horizontal scaling strategies to handle increased traffic and workload	Analyze

UNIT I INTRODUCTION TO CSS AND JAVASCRIPT **12 HOURS**

Introduction to Web: Server - Client - Communication Protocol (HTTP) – Structure of HTML Documents – Basic Markup tags – Working ith Text and Images with CSS– CSS Selectors – CSS Flexbox - JavaScript: Data Types and Variables - Functions - Events – AJAX: GET and POST

UNIT II SERVERSIDE PROGRAMMING WITH NODE JS **12 HOURS**

Introduction to Web Servers – Javascript in the Desktop with NodeJS – NPM – Serving files with the http module – Introduction to the Express framework – Server-side rendering with Templating Engines – Static Files - async/await - Fetching JSON from Express.

UNIT III ADVANCED NODE JS AND DATABASES **12 HOURS**

Introduction to NoSQL databases – MongoDB system overview - Basic querying with MongoDB shell – Request body parsing in Express – NodeJS MongoDB connection – Adding and retrieving data to

MongoDB from NodeJS – Handling SQL databases from NodeJS – Handling Cookies in NodeJS – Handling User Authentication with NodeJS.

UNIT IV ADVANCED CLIENT-SIDE PROGRAMMING **12 HOURS**

React JS: ReactDOM - JSX - Components - Properties – Fetch API - State and Lifecycle - -JS Local storage - Events - Lifting State Up - Composition and Inheritance

UNIT V APP IMPLEMENTATION IN CLOUD **12 HOURS**

Cloud providers Overview – Virtual Private Cloud – Scaling (Horizontal and Vertical) – Virtual Machines, Ethernet and Switches – Docker Container – Kubernetes

TOTAL: 60 HOURS

TEXT BOOKS:

1. David Flanagan, (2020). Java Script: The Definitive Guide, 7th Edition, O'Reilly Media, Inc.
2. Matt Frisbie, (2019). Professional JavaScript for Web Developers, 4th Edition, Wiley Publishing, Inc.
3. Alex Banks, Eve Porcello, (2020). *Learning React*, 2nd Edition, O'Reilly Media, Inc.

REFERENCE BOOKS:

1. Marc Wandschneider, (2016). *Learning Node*, 2nd Edition, Addison-Wesley Professional.
2. Joe Beda, Kelsey Hightower, Brendan Burns, (2017). *Kubernetes: Up and Running*, 1st edition, Reilly Media.
3. Paul Zikopoulos, Christopher Bienko, Chris Backer, Chris Konarski, Sai Vennam, (2021). *Cloud Without Compromise*, 1st Edition, O'Reilly Media.

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	1	1	1	-	-	-	-	-	-
CO2	3	-	3	2	3	2	-	2	2	-	-	-	-	-	-	1	-
CO3	3	-	-	1	-	1	-	1	-	-	1	-	-	-	-	-	1
CO4	3	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	-	3	2	3	2	-	2	2	-	-	-	-	-	-	-	2
Average	**3**	**-**	**3**	**1.7**	**2.3**	**1.7**	**-**	**1.7**	**1.7**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**1.5**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester III

24CAP305D **BIG DATA ANALYTICS** **5H-3C**

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required.

COURSE OBJECTIVES (CO):

- To understand the evolution and architecture of Big Data.
- To learn the virtualization concept of Big Data.
- To learn the Hadoop framework in processing Big Data.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Summarize the evolution and scope challenges of Data Management in Big Data.	Understand
CO2	Explain the principles of data management to handle Big Data effectively	Understand
CO3	Illustrate the suitability of different Big Data technologies for specific use cases.	Understand
CO4	Summarize the concepts of Big Data Analytics.	Understand
CO5	Define the problem-solving skills with different strategies.	Remembering

UNIT I FUNDAMENTALS OF BIG DATA **12 HOURS**

The Evolution of Data Management Understanding the Waves of Managing Data- Defining BigData - Big Data Management Architecture- The Big Data Journey -Big Data Types-Defining Structured Data-Defining Unstructured Data-Putting Big Data Together.

UNIT II BIG DATA STACK **12 HOURS**

Basics of Virtualization - The importance of virtualization to big data -Server virtualization Application virtualization - Network virtualization -Processor and memory virtualization Data and storage virtualization.

UNIT III – HADOOP **12 HOURS**

Hadoop - Hadoop Distributed File System - Hadoop MapReduce- The Hadoop foundation and Ecosystem.

UNIT IV BIG DATA ANALYTICS **12 HOURS**

Big Data Analytics-Text Analytics and Big Data-Customized Approaches for Analysis of Big Data.

UNIT V INTEGRATING DATA SOURCES **12 HOURS**

Integrating Data Sources-Real-Time Data Streams and Complex Event Processing-Operationalizing Big Data.

TOTAL: 60 HOURS

TEXT BOOKS

1. Michael Minelli, Michele Chambers, Ambiga Dhiraj, (2013). *Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses*, Wiley Publications, New Delhi.
2. Judith Hurwitz, Alan Nugent, Fern Halper, Marcia Kaufman, (2013). *Big Data For Dummies,* Wiley India, New Delhi.

REFERENCE BOOKS:

1. Paul Zikopoulos, Dirk deRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, DavidCorrigan, (2012). *Harness the Power of Big Data The IBM Big Data Platform*, Tata McGrawHill Publications, New Delhi.
2. Zikopoulos, Paul, Chris Eaton, (2011). *Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data*, Tata McGraw Hill Publications, New Delhi.

WEBSITE LINKS:

1. www.oracle.com/bigdata
2. www.planet-data.eu/sites/default/files/Big_Data_Tutorial_part4.pdf
3. www.ibm.com/developerworks/data

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	1	-	2	1	-	2	3	-	2	-	-	-	-	-	-
CO2	3	-	-	1	3	2	-	1	-	2	1	-	-	-	-	-	1
CO3	3	-	2	-	-	-	-	1	2	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	1	-	-	3	3	3	-	-	-	-	2	-
CO5	3	-	-	3	2	2	-	1	-	-	-	-	-	-	-	-	-
Average	**3**	**-**	**1.5**	**2**	**2.3**	**1.5**	**-**	**1.3**	**2.7**	**2.5**	**2**	**-**	**-**	**-**	**-**	**2**	**1**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester III

24CAP305N **INTERNET OF THINGS** **5H-3C**

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To understand the Introduction to IoT and Architectural Overview of IoT
- To understand the various IoT Protocols (Datalink, Network, Transport, Session, Service)
- To understand the communication technologies in IoT Know the IoT protocols and web of things

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Explain the fundamental concepts of Internet of Things.	Understand
CO2	Analyze the protocols, standardization efforts, and security.	Analyze
CO3	Analyze the Web of Things with the Internet of Things.	Analyze
CO4	Demonstrate the integration of Internet of Things.	Understand
CO5	Summarize the role of IoT in enhancing autonomy and agility.	Understand

UNIT I – INTRODUCTION **12 HOURS**

Internet Layers - Protocols - Packets - Services - Performance parameters - Peer-to-peer networks Sensor networks - Multimedia - IOT Definitions and Functional Requirements – Motivation – Architecture - Web 3.0 View of IoT– Ubiquitous IoT Applications – Four Pillars of IoT – DNAof IoT - The Toolkit Approach for End-user Participation in the Internet of Things. Middleware for IoT: Overview – Communication middleware for IoT –IoT Information Security.

UNIT II IOT PROTOCOLS **12 HOURS**

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – point-to-point protocols - Ethernet protocals - cellular Internet access protocol - Machine-to-machine protocol - Modbus – KNX – Zigbee Architecture – Network layer – APS layer – Security.

UNIT III WEB OF THINGS **12 HOURS**

Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence. Cloud of Things: Grid/SOA and Cloud Computing – Cloud Middleware – Cloud Standards – Cloud Providers and Systems – Mobile Cloud Computing – The Cloud of Things Architecture.

UNIT IV INTEGRATING IOT **12 HOURS**

Integrated Billing Solutions in the Internet of Things Business Models for the Internet of Things Network Dynamics: Population Models – Information Cascades - Network Effects - Network Dynamics: Structural Models - Cascading Behavior in Networks - The Small- World Phenomenon.

UNIT V APPLICATIONS **12 HOURS**

The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments - Resource Management in the Internet of Things: Clustering, Synchronization and Software Agents. Applications - Smart Grid – Electrical Vehicle Charging Domain Specific IoT: Home Automation-Agriculture-Health and Lifestyle monitoring system-Cities-Smart Parking-Smart Roads-Surveillance. Industry: Machine Diagnosis-Indoor Air Quality Monitoring System.

TOTAL: 60 HOURS

TEXT BOOKS:

1. Olivier Hersent, Omar Elloumi and David Boswarthick, (2012). *The Internet of Things: Applications to the Smart Grid and Building Automation*. Wiley.
2. Olivier Hersent, David Boswarthick, Omar Elloumi, (2012). *The Internet of Things – Keyapplications and Protocols,* Wiley.

REFERENCE BOOKS:

1. Dieter Uckelmann; Mark Harrison; Florian Michahelles- (Eds.), (2011). Architecting the Internet of Things, Springer.

WEBSITE LINKS:

1. https://www.ibm.com/blogs/internet-of-things/what-is-the-iot

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	-	-	-	1	-	-	3	3	2	-	-	-	-	-	-
CO2	3	-	3	2	2	1	-	2	-	-	-	-	-	-	-	3	3
CO3	3	-	-	2	2	1	-	2	-	-	-	-	-	-	-	-	2
CO4	3	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
CO5	3	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	1
Average	**3**	**-**	**3**	**2**	**2**	**1**	**-**	**1.7**	**3**	**3**	**1.5**	**-**	**-**	**-**	**-**	**3**	**2**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester III

24CAP305S **SOFTWARE METRICS** **5H-3C**

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To understand the basic terminology and state fundamental facts about software metrics and process models.
- To identify the essential elements of a given metric or model, describe the interrelationships among its various elements
- To understand software process assessment cycles, complexity metrics and models.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Explain the basic terminology and state fundamental facts about software metrics and process models	Understand
CO2	Identify the basic quality tools in software development	Remembering
CO3	Analyze the software process metrics in the process of software testing	Analyze
CO4	Measure and analyze customer satisfaction in development of software	Analyze
CO5	Assess the software project using the metrics	Analyze

UNIT I INTRODUCTION **12 HOURS**

Software quality-popular views-the role of the customer-software quality- Total quality management. Software development process models-the spiral model-iterative development process-The Cleanroom Methodology-Process Maturity Framework and Quality standards. Fundamentals of Measurement Theory-Level of measurement- Reliability and validity- Measurement Errors.

UNIT II APPLYING THE SEVEN BASIC QUALITY TOOLS **12 HOURS**

Applying the seven basic quality tools in software development-Defect removal effectiveness- The Rayleigh Model-Exponential distribution and reliability growth models-Quality management models.

UNIT III PROCESS METRICS FOR SOFTWARE TESTING **12 HOURS**

Process metrics for software testing-Complexity metrics and models-Metrics and lessons learned for object-oriented projects-Availability metrics.

UNIT IV MEASURING AND ANALYZING **12 HOURS**

Measuring and analyzing customer satisfaction-Conducting in-process quality assessments.

UNIT-V - SOFTWARE PROJECT ASSESSMENTS **12 HOURS**

Software project assessments-Dos and Don'ts of software process improvement-Using function point metrics to measure software process improvement-Concluding remarks.

TEXT BOOKS:

1. Norman Fenton**, (**2014). *Software Metrics: A Rigorous and Practical Approach*, Third Edition, Chapman & Hall/CRC Innovations in Software Engineering and Software Development Series.
2. Stephen H.Kan, (2013). *Metrics and Models in Software Quality Engineering*, Second Edition, Pearson India.
3. C. Ravindranath Pandian**, (**2003). *Software Metrics: A Guide to Planning, Analysis, and Application*.

WEBSITE LINKS:

1. https**://**www.digimat.in/nptel/courses/video/106101061/L21.html

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-
CO2	3	-	-	1	-	1	-	2	-	2	2	-	-	-	-	-	-
CO3	3	-	2	3	3	2	-	2	3	-	-	-	-	-	-	2	-
CO4	3	-	2	2	3	2	-	2	3	-	-	-	-	-	-	-	2
CO5	3	-	2	2	3	2	-	2	3	-	-	-	-	-	-	1	-
Average	**3**	**-**	**2**	**2**	**3**	**1.8**	**-**	**2**	**3**	**1.5**	**2**	**-**	**-**	**-**	**-**	**1.5**	**2**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester III

24CAP305W **SERVICE ORIENTED ARCHITECTURE** **5H-3C**

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To enable seamless communication and interaction between heterogeneous systems and technologies.
- To establish policies and mechanisms for governing service interactions, access control, data privacy, and compliance with regulatory requirements.
- To provide a foundational approach for transitioning to microservices architecture.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Construct to build applications based on XML	Apply
CO2	Explain the service orientation concepts, benefits of SOA	Understand
CO3	Analyze the various web services and WS standards	Analyze
CO4	Compare the various web services extensions to develop solutions	Understand
CO5	Illustrate service modeling, service-oriented analysis and design for application development	Understand

UNIT I INTRODUCTION TO XML **12 HOURS**

XML document structure – Well-formed and valid documents – DTD – XML Schema – Parsing XML using DOM, SAX – XPath - XML Transformation and XSL – X Query.

UNIT II SERVICE ORIENTED ARCHITECTURE (SOA) BASICS **12 HOURS**

Characteristics of SOA, Benefits of SOA, Comparing SOA with Client-Server and Distributed architectures – Principles of Service Orientation – Service layers.

UNIT III WEB SERVICES (WS) AND STANDARDS **12 HOURS**

Web Services Platform – Service descriptions – WSDL – Messaging with SOAP – Service discovery – UDDI – Service-Level Interaction Patterns – Orchestration and Choreography.

UNIT IV WEB SERVICES EXTENSIONS **12 HOURS**

WS Addressing – WS Reliable Messaging – WS Policy – WS Coordination – WS Transactions – WS Security – Examples.

UNIT V SERVICE ORIENTED ANALYSIS AND DESIGN **12 HOURS**

SOA delivery strategies – Service oriented analysis – Service Modelling – Service oriented design – Standards and composition guidelines – Service design – Business process design – Case Study.

TOTAL: 60 HOURS

TEXT BOOKS:

1. Thomas Erl, (2005), *Service Oriented Architecture: Concepts, Technology and Design*, Pearson Education.
2. Sandeep Chatterjee and James Webber, (2004). *Developing Enterprise Web Services: An Architect's Guide*, Prentice Hall.
2. James McGovern, Sameer Tyagi, Michael E Stevens and Sunil Mathew, (2003). *Java Web Services Architecture*, Elsevier.

REFERENCE BOOKS:

1. Ron Schmelzer et al, (2002). *XML and Web Services*, Pearson Education.
2. Frank P.Coyle, (2002). *XML, Web Services and the Data Revolution*, Pearson Education.
3. Thomas Erl, (2005). *Service Oriented Architecture: Concepts, Technology, and Design*, Pearson Education

WEBSITE LINKS

1. https://www.w3schools.com/xml/xml_whatis.asp
2. https://www.javatpoint.com/service-oriented-architecture

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	3	3	2	3	-	2	3	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-
CO3	3	-	3	2	3	2	-	3	3	-	-	-	-	-	-	2	2
CO4	3	-	-	-	-	-	-	1	-	2	1	-	2	-	-	-	-
CO5	3	-	2	2	-	3	-	2	2	-	-	-	-	-	-	-	-
Average	**3**	**-**	**2.7**	**2.3**	**2.5**	**2.7**	**-**	**2**	**2.7**	**2**	**1**	**-**	**2**	**-**	**-**	**2**	**2**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

24CAP312D **NOSQL DATABASE - PRACTICAL** **5H-3C**

Instruction Hours / Week: L: 0 T: 0 P: 5 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required.

COURSE OBJECTIVES (CO):

- To explore different types of NoSQL databases (document-based, key-value, column-family, graph-based) and their use cases.
- To implement SSL/TLS encryption and role-based access control (RBAC) to secure data.
- To optimize database configurations and indexes based on performance metrics.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Create indexes on fields in your database to improve query performance	Create
CO2	Implement different concurrency control mechanisms	Create
CO3	Experiment with transactions or atomic operations to ensure data integrity	Create
CO4	Evaluate performance metrics	Evaluate
CO5	Design to handle scalability and fault tolerance.	Create

List of Programs **60 HOURS**

1. Install a NoSQL database of your choice (such as MongoDB, Cassandra, Redis, Neo4j, etc.) on your local machine.
2. Practice creating, reading, updating, and deleting data in your chosen NoSQL database. Get comfortable with the syntax and APIs provided by the database.
3. Design a simple data model for a sample application and implement it in your NoSQL database. Consider the structure of your data and how it will be queried.
4. Experiment with creating indexes on fields in your database to improve query performance. Analyze query execution plans to understand optimization opportunities.
5. Set up a clustered environment or replica set in your NoSQL database to understand how it handles scalability and fault tolerance.

6. Practice backing up and restoring data in your NoSQL database. Understand the different backup strategies supported by the database.
7. Explore how your chosen NoSQL database handles concurrent writes and reads. Experiment with different concurrency control mechanisms if applicable.
8. Experiment transactions or atomic operations with NoSQL database to understand how they work and their limitations.
9. Configure authentication and authorization mechanisms in your NoSQL database to ensure data security. Explore features like SSL/TLS encryption and role-based access control.
10. Write scripts to simulate various workloads (read-heavy, write-heavy, mixed) and measure the performance of your NoSQL database under different scenarios.
11. Develop a sample application (web, mobile, or desktop) that interacts with your NoSQL database. Implement CRUD operations and other features using the database's API.
12. Set up monitoring and alerting for your NoSQL database to track performance metrics, detect issues, and take proactive action when necessary

TOTAL: 60 HOURS

TEXT BOOKS:

1. Sadalage, P. & Fowler, (2019). *NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence*, 1st Edition, Wiley Publications.

WEBSITE LINKS:

1. https://www.ibm.com/cloud/learn/nosql-databases
2. https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp
3. https://www.geeksforgeeks.org/introduction-to-nosql/
4. https://www.javatpoint.com/nosql-database

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	3	3	-	2	-	2	3	1	2	-	-	-	-	2	-
CO2	3	-	3	3	-	2	-	2	3	2	2	-	-	-	-	-	2
CO3	3	-	3	3	3	3	-	3	3	-	-	-	-	-	-	-	-
CO4	3	-	3	3	3	3	-	3	3	-	1	-	-	-	-	-	2
CO5	3	-	1	1	1	2	-	2	3	-	-	-	-	-	-	-	-
Average	**3**	**-**	**2.6**	**2.6**	**2.3**	**2.4**	**-**	**2.4**	**3**	**1.5**	**1.7**	**-**	**-**	**-**	**-**	**2**	**2**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester III

24CAP312N SOFTWARE DEFINED NETWORK – PRACTICAL 5H-3C

Instruction Hours/week: L:0 T:0 P:5 **Marks: Internal:40 External:60 Total:100**

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required.

COURSE OBJECTIVES (CO):

- To configure virtual network topologies and experiment with different network configurations.
- To gain proficiency in configuring and managing OpenFlow controllers and switches.
- To implement network-wide changes dynamically using SDN principles.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Summarize the concepts of Mininet and legacy networks	Understand
CO2	Design the controllers for transmitting messages	Create
CO3	Apply the Networking technique for configuring network	Apply
CO4	Develop the SDN applications	Create
CO5	Apply the protocols and routing techniques	Apply

LIST OF PROGRAMS **36 HOURS**

1. Introduction to Mininet
2. Legacy Networks: BGP Example as a Distributed System and Autonomous Forwarding Decisions
3. Early Efforts of SDN: MPLS Example of a Control Plane that Establishes Semi-static Forwarding Paths
4. Introduction to SDN- SDN Network Configuration
5. Configuring VXLAN to Provide Network Traffic Isolation
6. OpenFlow Protocol Management
7. Routing within an SDN network
8. Incremental Deployment of SDN Networks within Legacy Networks
9. Configuring Virtual Private LAN Service (VPLS)
10. Applying Equal-cost Multi-path Protocol (ECMP) within SDN networks

TOTAL: 60 HOURS

TEXT BOOKS:

1. Paul Goransson and Chuck Black, (2014). *Software Defined Networks: A Comprehensive Approach,* Morgan Kaufmann Publications.
2. Thomas D. Nadeau & Ken Gray, (2013). *SDN - Software Defined Networks,* O'Reilly Publications.
3. Siamak Azodolmolky, (2013). *Software Defined Networking with Open Flow,* Packt Publishing.
4. Kreutz, Diego, (2015). *Software-defined networking: A comprehensive survey,* Proceedings of the IEEE 103.1.
5. Nunes, Bruno AA, (2014). *A survey of software-defined networking: Past, present, and future of programmable networks Communications Surveys & Tutorials,* IEEE 16.3.

REFERENCE BOOKS:

1. Lantz, Bob, Brandon Heller, and Nick McKeown, (2010). *A network in a laptop: rapid prototyping for software-defined networks,* Proceedings of the 9th ACM SIGCOMM Workshop on Hot Topics in Networks, ACM.
2. Monsanto, Christopher, (2013). *Composing software defined networks,* Presented as part of the 10th USENIX Symposium on Networked Systems Design and Implementation (NSDI 13).

WEBSITE LINKS

1. https://www.geeksforgeeks.org/software-defined-

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	1	2	2	-	-	-	-	-	-
CO2	3	-	2	1	2	1	-	1	2	-	-	-	-	-	-	-	-
CO3	3	-	3	2	3	2	-	1	3	-	-	-	-	-	-	1	-
CO4	3	-	3	3	3	2	-	2	3	-	-	-	-	-	-	1	1
CO5	3	-	3	2	3	2	-	2	3	-	-	-	-	-	-	-	1
Average	**3**	**-**	**2.8**	**2**	**2.8**	**1.8**	**-**	**1.5**	**2.4**	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**1**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester III

24CAP312S SOFTWARE TESTING AND QUALITY ASSURANCE - PRACTICAL **5H-3C**

Instruction Hours / Week: L: 0 T: 0 P: 5 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

- Programming Skills.

COURSE OBJECTIVES (CO):

- To measure software performance under various load conditions through stress testing, load testing, and scalability testing.
- To identify performance bottlenecks and optimize software to handle expected user loads.
- To implement security testing techniques to ensure the protection of sensitive data and system integrity.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Design effective test cases by identifying test scenarios	Create
CO2	Evaluate system performance under various load conditions	Evaluate
CO3	Apply security testing using specialized tools	Apply
CO4	Implement the integration on individual components or modules	Create
CO5	Analyze test metrics to assess testing progress	Analyze

List of Programs **36 HOURS**

1. Create a test plan outlining the testing approach, test objectives, scope, resources, and schedule.
2. Write test cases based on requirements, covering both positive and negative scenarios, boundary cases, and edge cases.
3. Execute test cases manually or using automated testing tools to validate the functionality of the software.
4. Document any defects or issues found during testing, including steps to reproduce and severity/priority classification.
5. Track defects through their lifecycle, from discovery to resolution, using a defect tracking system or issue management tool.

6. Perform regression testing to ensure that new changes or fixes haven't introduced unintended side effects or regressions.
7. Test the integration of individual components or modules to ensure they work together as expected.
8. Measure the performance of the software under various load conditions, including stress testing, load testing, and scalability testing.
9. Evaluate the security of the software by identifying and mitigating potential vulnerabilities, such as SQL injection, cross-site scripting, and authentication flaws.
10. Develop automated test scripts using testing frameworks and tools to increase efficiency and repeatability of testing activities.
11. Track and analyze key metrics related to testing, such as defect density, test coverage, and test execution status, and generate reports for stakeholders.

TOTAL: 60 HOURS

TEXT BOOKS

1. Dorothy Graham,Rex Black, and et.al, (2011). *Foundations of Software Testing - ISTQBCertification*, 3rd Edition, Cengage Learning.
2. R.Rajani, and P.P.Oak, (2004). *Software Testing*, Tata Mcgraw Hill, New Delhi.
3. Boris Beizer, (2003). *Software Testing Techniques*, II Edition., Dream Tech India, NewDelhi.
4. Marnie L Hutcheson, (2003). *Software testing fundamentals*, 1st Edison, Wiley, DreamTech India, New Delhi.
5. Burnstein, (2003). *Practical Software Testing*, Springer International Edition.

WEBSITE LINKS

1. http://my.safaribooksonline.com
2. http://www2.sas.com

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	2	-	1	-	-	1	1	1	1	-	-	-	-	-	-
CO2	3	-	3	3	2	3	-	2	3	-	-	-	-	-	-	-	-
CO3	3	-	3	2	3	3	-	3	3	-	-	-	-	-	-	2	1
CO4	3	-	3	3	3	3	-	3	3	-	-	-	-	-	-	-	2
CO5	3	-	2	-	3	1	-	1	2	-	-	-	-	-	-	2	-
Average	**3**	**-**	**2.6**	**2.7**	**2.4**	**2.5**	**-**	**2**	**2.4**	**1**	**1**	**-**	**-**	**-**	**-**	**2**	**1.5**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester III

24CAP312W FULL STACK WEB DEVELOPMENT - PRACTICAL 5H-3C

Instruction Hours / Week: L: 0 T: 0 P: 5 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (COS):

- To learn to create interactive forms and validate user input using client-side JavaScript.
- To develop proficiency in CRUD operations with a NoSQL database (MongoDB), integrating with a Node.js backend.
- To implement a full-stack application using React for the front-end and Node.js for the back-end, utilizing JSON file storage.

COURSE OUTCOMES (COS):

Upon completion of this course, Students will able to

COs	Course Outcomes	Blooms Level
CO1	Implement the client side of the web application using java script	Create
CO2	Develop and deploy server side applications using NodeJS	Create
CO3	Develop a web application using NodeJS and Express	Create
CO4	Implement a SPA using React	Create
CO5	Develop a full stack single page application using React, NodeJS, and a Database (MongoDB or SQL)	Create

LIST OF PROGRAMS **60 HOURS**

1. Create a form and validate the contents of the form using JavaScript.
2. Get data using Fetch API from an open-source endpoint and display the contents in the form of a card.
3. Create a NodeJS server that serves static HTML and CSS files to the user without using Express.
4. Create a NodeJS server using Express that stores data from a form as a JSON file and displays it in another page. The redirect page should be prepared using Handlebars.
5. Create a NodeJS server using Express that creates, reads, updates and deletes students' details and stores them in MongoDB database. The information about the user should be obtained from a HTML form.

6. Create a NodeJS server that creates, reads, updates and deletes event details and stores them in a MySQL database. The information about the user should be obtained from a HTML form.
7. Create a counter using ReactJS
8. Create a Todo application using ReactJS. Store the data to a JSON file using a simple NodeJS server and retrieve the information from the same during page reloads.
9. Create a simple Sign up and Login mechanism and authenticate the user using cookies. The user information can be stored in either MongoDB or MySQL and the server should be built using NodeJS and Express Framework.
10. Create and deploy a virtual machine using a virtual box that can be accessed from the host computer using SSH.
11. Create a docker container that will deploy a NodeJS ping server using the NodeJS image.

TOTAL: 60 HOURS

TEXT BOOKS:

1. David Flanagan, (2020) .*Java Script: The Definitive Guide*, O'Reilly Media, Inc, 7th Edition.
2. Matt Frisbie, (2019). *Professional JavaScript for Web Developers*, Wiley Publishing, Inc, 4th Edition, ISBN: 978-1-119-36656-0.
3. Alex Banks, Eve Porcello, , (2020). *Learning React* , O'Reilly Media, Inc, 2nd Edition
4. Marc Wandschneider, 2016. *Learning Node*, Addison-Wesley Professional, 2nd Edition.

REFERENCE BOOKS:

1. Joe Beda, Kelsey Hightower, Brendan Burns, (2017). *Kubernetes: Up and Running*, O'Reilly Media, 1st edition,
2. Paul Zikopoulos, Christopher Bienko, Chris Backer, Chris Konarski, Sai Vennam, (2021). *Cloud without Compromise*, O'Reilly Media, 1st edition

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	3	-	3	3	2	2	-	2	3	1	1	-	-	-	-	-	-
CO2	3	-	3	3	2	2	-	2	3	1	1	-	-	-	-	2	2
CO3	3	-	3	3	2	2	-	2	3	1	1	-	-	-	-	-	1
CO4	3	-	3	3	2	2	-	2	3	1	1	-	-	-	-	-	1
CO5	3	-	3	3	2	2	-	2	3	1	1	-	-	-	-	-	2
CO	3	0	3	3	2	2	0	2	3	1	1	0	0	0	0	2	2

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester III

24CAP391A **INTERNSHIP** **0H-2C**

Instruction Hours / Week: L: 0 T: 0 P: 0 **Marks:** Internal**: 100** External**: 0** Total**: 100**

End Semester Exam:3 Hours

Semester III

24CAP304DSE1 **MACHINE LEARNING ENGINEERING FOR PRODUCTION SPECIALIZATION** **5H-3C**

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

Semester III

24CAP304DSE2 INDUSTRY SPECIFIC APPLICATIONS OF GEN AI & RESPONSIBLE AI **5H-3C**

Instruction Hours / Week: L: 5 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam:3 Hours

Semester III

24CAP391B	**PROJECT / THESIS - I**	**30H-12C**

Instruction Hours / Week: L: 0 T: 0 P: 30 **Marks:** Internal**: 100** External**: 0** Total**: 100**

End Semester Exam:3 Hours

Semester III

24CAP491	**PROJECT AND VIVA VOCE**	**12C**

Instruction Hours / week: L:0 T:0 P:0 **Marks:** Internal**: 80** External**: 120 Total: 200**

End Semester Exam: 3 Hours

Semester I

24CAP101BC PROBLEM SOLVING AND PROGRAMMING IN C 2C

Instruction Hours/week: L:0 T:0 P:0 **Marks:** Internal**:00** External**:100** Total**:100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To develop algorithms to solve simple to complex problems using structured and modular programming techniques in C
- To train students in identifying and fixing errors (bugs) in programs using debugging tools and techniques
- To write modular and reusable code using functions and libraries in C

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes (COs)	Blooms Level
CO1	Analyze the efficiency of algorithms to determine their performance characteristics	Analyze
CO2	Explain to write algorithms using programming languages	Understand
CO3	Summarize the programming concepts such as variables, constants, operators, expressions, control statements	Understand
CO4	Explain how to work with arrays, strings, functions, and pointers	Understand
CO5	Evaluate file management operations	Evaluate

UNIT I INTRODUCTION TO COMPUTER PROBLEM SOLVING

Introduction – The Problem Solving aspect – Top down design – Implementation of algorithm – Program Verification – The efficiency of algorithms – The analysis of algorithms – Fundamental Algorithms

UNIT II PROGRAMMING AND ALGORITHMS

Programs and Programming – building blocks for simple programs -pseudo code representation – flow charts - Programming Languages - compiler –Interpreter, Loader and Linker - Program execution – Classification of Programming Language - Structured Programming Concept – Illustrated Problems: Algorithm to check whether a given number is Armstrong number or not- Find factorial of a number

UNIT III BASICS OF 'C', INPUT / OUTPUT & CONTROL STATEMENTS

Introduction- Identifier – Keywords - Variables – Constants – I/O Statements - Operators – Initialization Expressions – Expression Evaluation – Lvalues and Rvalues – Type Conversion in C –Formatted input and output functions - Specifying Test Condition for Selection and Iteration- Conditional Execution - and Selection – Iteration and Repetitive Execution- go to Statement – Nested Loops- Continue and break statements.

UNIT IV ARRAYS, STRINGS, FUNCTIONS AND POINTERS

Array – One dimensional Character Arrays- Multidimensional Arrays- Arrays of Strings – Two-dimensional character array – functions - parameter passing mechanism scope – storage classes – recursion - comparing iteration and recursion- pointers – pointer operators - uses of pointers- arrays and pointers – pointers and strings - pointer indirection pointers to
functions - Dynamic memory allocation.

UNIT V USER-DEFINED DATATYPES & FILES

Structures – initialization - nested structures – structures and arrays – structures and pointers - union– type def and enumeration types - bit fields - File Management in C – Files and Streams – File handling functions – Sequential access file- Random access file – Command line arguments.

TEXT BOOKS:

1. Sprankle, M., & Hubbard, J, (2019). *Problem Solving and Programming Concepts*, 9th Edition, Pearson.
2. King, K. N, (2015). *C Programming: A Modern Approach*, 3rd Edition, W. W. Norton & Company.

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	2	2	3	2	-	2	3	-	-	-	-	-	-	2	-
CO2	3	-	-	1	-	-	-	-	-	-	3	-	-	-	-	-	-
CO3	3	-	1	-	-	-	-	-	-	3	-	-	-	-	-	1	-
CO4	3	-	-	2	-	1	-	1	2	1	2	-	-	-	-	-	-
CO5	3	-	3	3	3	2	-	2	3	-	-	-	-	-	-	-	2
Average	**3**	**-**	**2**	**2**	**3**	**1.7**	**-**	**1.7**	**2.7**	**2**	**2.5**	**-**	**-**	**-**	**-**	**1.5**	**2**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester I

24CAP102BC **FOUNDATIONAL MATHEMATICS** **2C**

Instruction Hours/week: L:0 T:0 P:0 **Marks:** Internal**:00** External**:100** Total**:100**

End Semester Exam:3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- Gain the knowledge of mathematical and statistical techniques
- Learn the application of mathematical and statistical techniques to a wide range of business situations.
- Understand the use of statistical techniques for test of hypothesis.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Understand the basic concepts of arithmetic and geometric mean and different types of data collection.	Understand
CO2	Illustrate the use of mathematical and statistical techniques in business decision making	Analyze
CO3	Apply the formula and calculate descriptive measures of statistics	Apply
CO4	Analyze interpolation and probability	Analyze
CO5	Create and find the solution for the mathematical and statistical techniques	Create

UNIT I INTRODUCTIONS

Meaning and Definition of Statistics – Collection of data – Primary and Secondary - Classification and Tabulation – Diagrammatic and Graphical presentation Measures of Central tendency – Mean, Median, Mode, Geometric Mean and Harmonic Mean – simple problems.

UNIT II MEASURES OF DISPERSION

Measures of Dispersion – Range, Quartile Deviation, Mean Deviation, Standard Deviation and Co-efficient of Variation.

UNIT III CORRELATION AND REGRESSION ANALYSIS

Correlation –Meaning and Definition –Scatter diagram, Karl Pearson's co-efficient of Correlation, Spearman's Rank Correlation, Co-efficient of Concurrent deviation. Regression Analysis – Meaning of regression and linear prediction – Regression in two variables

UNIT IV PROBABILITY AND PROBABILITY DISTRIBUTION

Probability: Definition – Addition and multiplication Rules (only statements) – Simple business application problems – Probability distribution – Expected value concept – Theoretical probability distributions – Binomial, Poisson and Normal – Simple problems

UNIT V TEST OF HYPOTEHESIS

Hypothesis testing of Proportion and Mean – Single and two tailed tests – Errors in hypothesis testing – Measuring the power of hypothesis test - Chi-Square tests

TEXT BOOKS

1. Richard L Levin &David S Rubin – Statistics for Management– Pearson Education, Canada
2. S P Gupta – Statistical Methods– Sultan Chand and Sons

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	1	1	1	-	-	-	-	-	-
CO2	3	-	-	1	2	1	-	1	2	1	-	-	-	-	-	-	-
CO3	3	-	3	2	3	2	-	2	2	-	-	-	-	-	-	2	1
CO4	3	-	3	2	3	2	-	2	2	-	1	-	-	-	-	-	-
CO5	3	-	3	3	-	3	-	-	2	-	-	-	-	-	-	-	2
Average	**3**	**-**	**3**	**2**	**2.7**	**2**	**-**	**1.7**	**1.8**	**1**	**1**	**-**	**-**	**-**	**-**	**2**	**1.5**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

24EGPOE301 ENGLISH FOR COMPETITIVE EXAMINATION 3H-2C

Instruction Hours/week: L:3 T:0 P:0 **Marks:** Internal**:40** External**:60 T**otal**:100**

End Semester Exam:3Hours

PREREQUISITE:

Not required

Course Objectives (CO):

- To train learners to crack competitive exams
- To enhance their ability to speak in English and face an interview.
- To make the student apply, prepare and clear the competitive exams.
- To prepare the student to concentrate, stay positive and confident.
- To take even failure at ease and continue the target of clearing competitive exams.

Course Outcomes (COs):

Upon the completion of this course, students will be able to

COs	Course Outcomes	Blooms Level
CO1	execute the grammatical elements in competitive exams	Apply
CO2	identify the various skills to build a strong outer relationship	Understand
CO3	analyse logical reasoning questions	Analyse
CO4	execute the process of sharing the general knowledge with use of proper communication	Apply
CO5	translate the correct structure of sentence from one language to other	Understand

UNIT I Grammar **8 HOURS**

Number-Subject, Verb and Agreement-Articles-Sequences of Tenses-Common Errors

UNIT II Word Power **7 HOURS**

Idioms and Phrases-One word substitution-Synonyms-Antonyms-Words often confused

UNIT III Paragraph **7 HOURS**

Expansion of an idea

UNIT IV Writing **7 HOURS**

Essay- Letters-Memos-Agenda-Resume writing

UNIT V Speaking **7 HOURS**

Public Speaking-Group Discussion-Interview-Spoken English

TOTAL:36 HOURS

TEXT BOOK

1. Saraswathi,V. and Maya K. Mudbhatkal (2014). *English for Competitive Examinations*,Emerald: Chennai.

WEBSITES

1. https://www.ef.com/wwen/english-resources/english-idioms/
2. https://www.talkenglish.com/speaking/listbasics.aspx

CO, PO, PSO Mapping

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	-	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-
CO3	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	3	-	-	-	-	-		-	-	-	-	-	-	-	-	-
Average		**2.5**	**3**	**3**	**3**	**3**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

3-Strong; 2-Medium; 1-Low '-' – No Corrections

Semester III

24CMPOE301 PERSONAL FINANCE AND PLANNING 3H–2C

Instruction Hours / Week: L:3 T:0 P:0 **Marks:** Internal:**40** External:**60** Total:**100**

End Semester Exam: 3Hours

PREREQUISITE:

Basic understanding of financial management principles.

COURSE OBJECTIVES(CO):

- To familiarize students with the concept of Investment Planning and its methods.
- To examine the scope and methods of Personal Tax Planning.
- To analyze Insurance Planning and its relevance.

COURSE OUTCOMES(COs):

Learners should be able to

COs	Course Outcomes	Blooms Level
CO1	Familiarize with regard to the concept of Investment Planning and its methods	Understand
CO2	Examine the scope and ways of Personal Tax Planning;	Analyze
CO3	Analyze Insurance Planning and its relevance	Analyze
CO4	Develop an insight in to retirement planning and its relevance.	Create
CO5	Construct an optimal portfolio in real life situations	Create

UNIT I INTRODUCTION TO FINANCIAL PLANNING 7 HOURS

Financial goals, Time value of money, steps in financial planning, personal finance/loans, education loan, car loan & home loan schemes. Introduction to savings, benefits of savings, management of spending & financial discipline, Net banking and UPI, digital wallets, security and precautions against Ponzi schemes and online frauds such as phishing, credit card cloning, skimming.

UNIT II INVESTMENT PLANNING 7 HOURS

Process and objectives of investment, Concept and measurement of return & risk for various assets class, Measurement of portfolio risk and return,Diversification & Portfolio formation. Gold Bond; Real estate; Investment in Greenfield and brownfield Projects; Investment in fixed income instruments- financial derivatives& Commodity market in India. Mutual fund schemes including SIP; International investment avenues.

UNIT III PERSONAL TAX PLANNING 7 HOURS

Tax Structure in India for personal taxation, Scope of Personal tax planning, Exemptions and deductions available to individuals under different heads ofincome and gross total income, Special provision u/s 115BAC vis-à-vis General provisions of the Income-tax Act, 1961. Tax avoidance

versus tax evasion.

UNIT IV INSURANCE PLANNING **7 HOURS**

Need for Protection planning. Risk of mortality, health, disability and property. Importance of Insurance: life and non-life insurance schemes. Deductions available under the Income-tax Act for premium paid for different policies.

UNIT V RETIREMENT BENEFITS PLANNING **8 HOURS**

Retirement Planning Goals, Process of retirement planning, Pension plans available in India, Reverse mortgage, New Pension Scheme. Exemption available under the Income-tax Act, 1961 for retirement benefits.

TOTAL: 36 HOURS

TEXT BOOKS:

1. Indian Institute of Banking & Finance. (2017). *Introduction to Financial Planning,* Taxmann Publication., New Delhi.
2. Pandit, A. (2014). *The Only Financial Planning Book that You Will Ever Need*, Network Publications Ltd., Mumbai.

REFERENCE BOOKS:

1. Sinha, M. (2008). *Financial Planning: A Ready Reckoner*, McGraw HillEducation, New York.
2. Halan, M. (2018). *Let's Talk Money: You've Worked Hard for It, Now Make It Workfor You*, Harper Collins Publishers, New York.
3. Tripathi, V. (2017). *Fundamentals of Investment*, Taxmann Publication, New Delhi.

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	P012	P013	P014	P015	PSO1	PSO2
CO1	3	-	-	-	3	-	-	-	-	-	3	-	-	-	3	3	3
CO2	3	-	-	-	3	-	-	-	-	-	3	-	-	-	3	-	-
CO3	3	-	-	-	3	-	-	-	2	-	3	-	-	-	3	3	3
CO4	3	-	-	-	3	-	-	-	2	-	3	-	-	-	3	3	3
CO5	3	-	1	-		-	-	-	2	-	3	-	-	-	3	-	-
Average	3	-	1	-	3	-	-	-	2	-	3	-	-	-	3	3	3

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester III

24MBAPOE301 **ORGANIZATIONAL BEHAVIOUR** **3H-2C**

Instruction Hours/week: L:3 T:0 P:0 **Marks:** Internal**:40** External**:60** Total**:100**

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To understand the basic concepts of organizational behavior.
- To analyze the individual behavior traits required for performing as an individual or group.
- To obtain the perceiving skills to judge the situation and communicate the thoughts and ideas.
- To evaluate how to perform in group and team and how to manage the power, politics and conflict.
- To recognize the importance of organizational culture and organizational change, group and team work to managing the conflict between members of the organization

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Connect organizational behavior issues in the context of the organizational behavior theories and concepts.	Understand
CO2	Assess the behavior of the individuals and groups in organization and manage the stress.	Apply
CO3	Categorize team, power, politics and conflict arising between the members.	Analyze
CO4	Explain how organizational change and culture affect the working relationship within organizations.	Evaluate
CO5	Plan and exhibit the communications kills to convey the thoughts and ideas of case analysis to the individuals and group.	Analyze

UNIT I ORGANIZATION BEHAVIOR : INTRODUCTION **7 HOURS**

Organization Behavior: Meaning and definition - Fundamental concepts of Organization Behavior - Contributing disciplines to the Organization Behavior field – Organization Behavior Model - Significance of Organization Behavior in the organization success - Challenges and Opportunities for Organization Behavior.

UNIT II BEHAVIOUR AND PERSONALITY **7 HOURS**

Attitudes – Sources - Types - Functions of Attitudes – Attitude and Job satisfaction, Emotions and Moods – Emotional Intelligence – Organization Behavior Applications of Emotions and Moods, Learning – Theories of Learning. Personality – Determinants of personality- Theories of Personality - psycho-analytical, social learning, job-fit, and trait theories.

UNIT III PERCEPTION **7 HOURS**

Perception – factors influencing perception - Person Perception – Attribution Theory – Frequently Used Shortcuts in Judging Others- Perceptual Process- Perceptual Selectivity - Organization Errors of perception – Linkage between perception and Decision making.

UNIT IV GROUP AND STRESS MANAGEMENT **7 HOURS**

Foundation of Group Behavior - Concept of Group - Types of Groups - Stages of Group Development - Group Norms - Group Cohesiveness – Stress- Causes of Stress- Effects of Occupational stress- Coping strategies for stress.

UNIT V ORGANIZATION CULTURE AND CHANGE AND STRESS MANAGEMENT **8 HOURS**

Organizational culture- Definitions and Characteristics of Culture- Types of Culture – Creating and Maintaining an Organizational Culture. Organizational change –Meaning- Forces for Change- Managing Planned Change - Factors in Organizational Change - Resistance to change- Overcoming resistance to change.

TOTAL: 36 HOURS

TEXT BOOKS:

1. Fred Luthans. (2017). *Organizational Behavior: An Evidence - Based Approach*, 12th Edition, Mcgraw Hill Education, New Delhi.
2. Steven Mcshane and Mary Ann Von Glinow (2017), *Organizational Behavior*, 6th Edition, McGraw Hill Education, New Delhi
3. Robbins,S.P, and Judge,T.A.(2016). *Organizational Behaviour,* 16th edition, Prentice Hall of India, New Delhi

REFERENCE BOOKS:

1.Laurie J. Mullins (2016). *Management and Organisational behaviour*, 10th Edition, Pearson Education, New Delhi

2.Robbins,S. P, and Judge,T.A.(2016). *Essentials of Organizational Behavior*,13th Edition, Pearson Education

WEB SITES:

https://nptel.ac.in/courses/110/105/110105033/

CO, PO, PSO Mapping

COs	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO 9	PO1 0	PO1 1	PO1 2	PO1 3	PO1 4	PO1 5	PSO 1	PSO 2
CO1	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	
CO3	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	2	-
Average	**-**	**-**	**2**	**3**	**2**		**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.5**	**-**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

24CAPOE301 **ROBOTICS PROCESS AUTOMATION** **3H - 2C**

Instruction Hours/week: L:3 T:0 P:0 **Marks:** Internal**:40** External**:60 Total:100**

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To enable the understanding of RPA and the types of variables.
- To create expertism in handling the User Events and various types of Exceptions and strategies.
- To demonstrate the Deployment of the Robot and to maintain the connection.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Explain the RPA and the ability to differentiate it from other types of automation.	Understand
CO2	Analyze the different types of variables, Control Flow and data manipulation techniques.	Analyze
CO3	Summarize Image, Text and Data Tables Automation.	Understand
CO4	Evaluate the User Events and its types of Exceptions and strategies.	Evaluate
CO5	Illustrate the deployment of the robot and to maintain the connection.	Apply

UNIT I INTRODUCTION TO ROBOTIC PROCESS AUTOMATION **8 HOURS**

Scope and techniques of automation, Robotic process automation - What can RPA do?, Benefits of RPA, Components of RPA, RPA platforms, The future of automation. RPA Basics: History of Automation - What is RPA - RPA vs Automation - Processes & Flowcharts - Programming Constructs in RPA - What Processes can be Automated - Types of Bots - Workloads which can be automated - RPA Advanced Concepts - Standardization of processes - RPA Development methodologies - Difference from SDLC - Robotic control flow architecture - RPA business case - RPA Team - Process Design Document/Solution Design Document – Industries best suited for RPA - Risks & Challenges with RPA - RPA and emerging ecosystem.

UNIT II RPA TOOL INTRODUCTION AND BASICS 7 HOURS

Introduction -The User Interface - Variables - Managing Variables - Naming Best Practices - The Variables Panel - Generic Value Variables - Text Variables True or False Variables - Number Variables - Array Variables - Date and Time Variables Data Table Variables - Managing Arguments - Naming Best Practices - The Arguments Panel - Using Arguments - About Imported Namespaces - Importing New Namespaces- Control Flow - Control Flow Introduction - If Else Statements - Loops - Advanced Control Flow - Sequences - Flowcharts - About Control Flow - Control Flow Activities - The Assign Activity - The Delay Activity - The Do While Activity - The If Activity - The Switch Activity - The While Activity - The For Each Activity - The Break Activity - Data Manipulation- Data Manipulation Introduction - Scalar variables, collections and Tables -Text Manipulation - Data Manipulation - Gathering and Assembling Data

UNIT III ADVANCED AUTOMATION CONCEPTS & TECHNIQUES 7 HOURS

Recording Introduction - Basic and Desktop Recording - Web Recording - Input/Output Methods - Screen Scraping - Data Scraping - Scraping advanced techniques - Selectors - Defining and Assessing Selectors - Customization - Debugging - Dynamic Selectors - Partial Selectors - RPA Challenge - Image, Text & Advanced Citrix Automation - Introduction to Image & Text Automation - Image based automation - Keyboard based automation - Information Retrieval - Advanced Citrix Automation challenges - Best Practices - Using tab for Images - Starting Apps - Excel DataTables & PDF - Data Tables in RPA - Excel and Data Table basics - Data Manipulation in excel – Extracting Data from PDF - Extracting a single piece of data - Anchors - Using anchors in PDF.

UNIT IV HANDLING USER EVENTS & ASSISTANT BOTS, EXCEPTION HANDLING

7 HOURS

What are assistant bots? - Monitoring system event triggers - Hotkey trigger - Mouse trigger - System trigger - Monitoring image and element triggers - An example of monitoring email - Example of monitoring a copying event and blocking it - Launching an assistant bot on a keyboard event.

Exception Handling -Debugging and Exception Handling - Debugging Tools - Strategies for solving issues - Catching errors.

UNIT V - DEPLOYING AND MAINTAINING THE BOT 7 HOURS

Publishing using publish utility - Creation of Server - Using Server to control the bots - Creating a provision Robotfrom the Server - Connecting a Robot to Server - Deploy the Robot to Server - Publishing and managing updates - Managing packages - Uploading packages - Deleting packages.

TOTAL: 36 HOURS

TEXT BOOKS:

1. Alok Mani Tripathi. (2018). *Learning Robotic Process Automation*, Packt Publishing.
2. Frank Casale , Rebecca Dilla, Heidi Jaynes , Lauren Livingston.(2015). *Introduction to*

Robotic Process Automation:a Primer, Institute of Robotic Process Automation,1st Edition.

3. Richard Murdoch. (2018). *Robotic Process Automation: Guide to Building Software Robots, Automate Repetitive Tasks & Become an RPA Consultant*, Independently Published, 1st Edition.

REFERENCE BOOKS:

1. Srikanth Merinda. (2018). *Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation*, Consulting Opportunity Holdings LLC, 1st Edition.
2. Lim Mei Ying. (2018). *Robotic Process Automation with Blue Prism Quick Start Guide: Create software robots andautomate business processes*, Packt Publishing, 1st Edition.

WEBSITE LINKS:

1. https://www.uipath.com/rpa/robotic-process-automation
2. https://www.academy.uipath.com

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	-	-		2	-	-	2	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	3	-	-	3	-	-	-	-	-	-	-	-
CO3	-	-	-	3	-	-	2	-	3	-	-	-	-	-	-	-	-
CO4	2	2	-	-	-	-	2	1	2	-	-	-	-	-	-	-	-
CO5	-	2	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	**2.5**	**2**	**1**	**2.5**	**-**	**2.5**	**2**	**1**	**2.5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

24CSPOE301 **CYBER FORENSICS** **3H – 2C**

Instruction Hours/week: L: 3 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60** Total**: 100**

End Semester Exam: 3 Hours

PREREQUISITE:

- Basics of Cyber Security.

COURSE OBJECTIVES (CO):

- To understand about computer forensics and investigations.
- To know about digital evidence, e-mail investigation, and Mobile device forensics.
- To analyse and validate forensics data.

COURSE OUTCOMES (COs):

Upon the completion of this course, the students will be able to

COs	Course Outcomes	Blooms Level
CO1	Explain various investigation procedures and summarize duplication of digital evidence.	Evaluate
CO2	Apply the knowledge of digital evidences.	Apply
CO3	Design and develop various forensics tools and analyse the network forensics.	Analyze
CO4	Determine the systematic study of high-tech forensics	Evaluate
CO5	Analyze and validate digital evidence data	Analyze

UNIT I COMPUTER FORENSICS AND INVESTIGATIONS **7 HOURS**

Computer forensics and investigations as a profession – Preparing for computer investigations – Taking a systematic approach–Procedures for corporate high-tech investigations–Data recovery work stations and software– Conducting an investigation.

UNIT II DATA ACQUISITION **7 HOURS**

Data acquisition – Storage formats for digital evidence – Validating data acquisitions – Processing crime and incident scenes–Identifying digital evidence–Collecting evidence in private sector incident scenes – Preparing for search-seizing digital evidence at the scene-storing digital evidence –Reviewing a case.

UNIT III COMPUTER FORENSICS TOOLS **7 HOURS**

Current computer forensics tools–Software tools–Hardware tools–The Macintosh file structure and boot process – Computer forensics analysis and validation – Addressing data –Hiding techniques.

UNIT IV NETWORK FORENSICS **7 HOURS**

Virtual machines – Network forensics – Developing standard procedures – Live acquisitions – email

investigations – Investigating e-mail crimes and violations – Understanding e-mail servers – Cell phone and mobile device forensics.

UNIT V MOBILE DEVICE FORENSICS **8 HOURS**

Understanding mobile device forensics – Acquisition procedures –Report writing for high-tech investigations – Importance of reports – Guidelines for writing reports –Expert testimony in high-tech investigations. **TOTAL:36 HOURS**

TEXT BOOKS:

1. Bill Nelson, Amelia Phillips and Christopher Steuart,(2018). *Computer Forensics and Investigations*, Cengage Learning, 5th Edition.
2. Eoghan Casey. (2017). *Handbook of Digital Forensics and Investigation*, 1st Edition, Academic Press.
3. John R Vacca, (2016). *Computer Forensics*, 2nd Edition, Cengage Learning.

REFERENCE BOOKS:

1. John R. Vacca, (2005), *Computer Forensics: Computer Crime Scene Investigation*, 2nd Edition Cengage Learning.
2. Marjie T Britz, (2008), *Computer Forensics and Cyber Crime: An Introduction*, 2nd Edition, Pearson Education.
3. Mari E-Helen Maras, (2014). *Computer Forensics: Cybercriminals, Laws, and Evidence*, 2nd Edition Jones & Bartlett Learning.

WEBSITES:

1. www.cps.brockport.edu/~shen/cps301/figures/figure1.pdf
2. www.forensicsguru.com/devicedataextractionsimcell.php
3. www.nptel.ac.in/courses/106101060
4. www.samsclass.info/121/ppt/ch11.ppt
5. www.garykessler.net/library/role_of_computer_forensics.html
6. www.ukessays.com/essays/information-technology/computer-forensics-and-crime investigations-information-technology-essay.php.

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	-	-	3	-	-	-	-	-	-	-	2	-	-	-	-	2	-
CO2	-	-	3	-	1	-	-	-	-	-	-	-	-	-	-	-	2
CO3	3	-	-	-	-	1	2	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-		2	-	-	-	-	-	-	-	-	-	-
CO5	3	-	3	-	-	-	-	-	-	-	2	-	-	-	-	-	-
Average	**3**	**-**	**3**	**-**	**1**	**1**	**2**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**2**	**2**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester III

24MMPOE301 **CODING THEORY** **3H - 2C**

Instruction Hours/week: L:3 T:0 P:0 **Marks:** Internal**:40** External**:60** Total:**100**

End Semester Exam: 3 Hours

PREREQUISITE:

- Algebra, Probability and Statistics, Digital Communication, Programming Skills.

COURSE OBJECTIVES (CO):

- To understand the communication channels and the importance of error correction.
- To explore the linear codes, self-orthogonal codes, and self-dual codes.
- To learn about the cyclic codes, their properties, and decoding methods.

COURSE OUTCOMES (COs):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Understand the fundamental concepts of error detection, correction, and decoding in communication channels.	Understand
CO2	Apply the concepts of generator matrix and parity check matrix in encoding and decoding linear codes.	Apply
CO3	Analyze different types of codes, including Binary and q-ary Hamming codes, Golay codes, and MDS codes, for their error-correcting capabilities.	Analyze
CO4	Understand the definitions and properties of cyclic codes.	Understand
CO5	Apply BCH codes and Reed Solomon codes to various coding problems.	Apply

UNIT I ERROR DETECTION, CORRECTION AND DECODING **7 HOURS**

Communication channels – Maximum likelihood decoding – Hamming distance – Nearest neighbourhood minimum distance decoding – Distance of a code.

UNIT II LINEAR CODES **7 HOURS**

Linear codes – Self orthogonal codes – Self dual codes – Bases for linear codes – Generator matrix and parity check matrix – Encoding with a linear code – Decoding of linear codes – Syndrome decoding.

UNIT III BOUNDS IN CODING THEORY **8 HOURS**

The main coding theory problem – lower bounds - Sphere covering bound – Gilbert Varshamov bound – Binary Hamming codes – q-ary Hamming codes – Golay codes – Singleton bound and MDS codes – Plotkin bound.

UNIT IV CYCLIC CODES **7 HOURS**

Definitions – Generator polynomials – Generator matrix and parity check matrix – Decoding of Cyclic codes.

UNIT V SPECIAL CYCLIC CODES **7 HOURS**

BCH codes – Parameters of BCH codes – Decoding of BCH codes – Reed Solomon codes.

TOTAL: 36 HOURS

TEXT BOOKS:

1. Hill, H. (1986). *A first course in Coding theory*, OUP.
2. San Ling and Chaping Xing, (2004). *Coding Theory: A first course*, Cambridge University Press.

REFERENCE BOOKS:

1. Berlekamp, E.R. (1968). *Algebraic Coding Theory*, Mc Graw – Hill.
2. Lin, S. and Costello, D. J. (1983). *Error control Coding: Fundamentals and Applications*, Prentice – Hall, Inc., New Jersey.
3. Vera Pless, (1982). *Introduction to the Theory of Error Correcting Codes*, Wiley, New York.

WEBSITES:

1. https://nptel.ac.in/courses/108104092
2. https://nptel.ac.in/courses/117106031

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
CO2	3	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO3	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
CO4	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO5	3	2	1	-	-	-	1	-	-	-	-	-	-	-	-	-	1
Average	**2.4**	**1.4**	**1**	**-**	**-**	**-**	**1**	**-**	-	-	-	**-**	-	-	-	-	**1**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester-III

24PHPOE301 ELECTRICAL APPLIANCES AND SERVICING 3H – 2C

Instruction Hours/week: L: 3 T: 0 P: 0 **Marks:** Internal**: 40** External**: 60 T**otal**: 100**

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To create awareness about types and handling of domestic appliances
- To acquire knowledge about principle of operation, working and application of various domestic appliances.
- To gain the skills in assembly, repair, installation, testing and maintenance of domestic appliances.
- To acquire skills in entrepreneurship

COURSE OUTCOMES (COs):

Upon the completion of this course, the students will be able to

COs	Course Outcomes	Blooms Level
CO1	Repair maintenance of the basic electrical and electronics appliances	Apply
CO2	Identification to protective devices	Understand
CO3	Repair and maintenance of the split Vacuum Cleaner and washing machine	Analysis
CO4	Repair and maintenance of the electric fan & hair drier	Apply
CO5	Acquire knowledge about tools, equipment and Instruments	Understand

UNIT I INSTRUMENTS AND TESTING 8 HOURS

Introduction – voltage tester screwdriver – continuing test – insulation test – measurement of power for dc & ac circuits. **Electrical Cooking Appliances** introduction – types – construction – electric toaster – types – automatic and non-automatic. **Electric Iron Box** types – non-automatic – automatic – construction and working – comparison – trouble shooting – Steam iron box.

UNIT II WATER HEATERS & COFFEE MAKERS 7 HOURS

Water heater – function – types – electric kettle – immersion water heater – construction and working – storage water heaters – non pressure type – pressure type – construction and working – repairs & remedies – coffee maker – types – construction and working of percolator type.

UNIT III ELECTRIC MIXER & EGG BEATERS 7 HOURS

Electric maker – function and its construction – general operating instruction – caution – cleaning – repairs

and remedies – egg beaters – hand operated crank type – electric type and its construction.

UNIT IV VACUUM CLEANER AND WASHING MACHINE 7 HOURS

Vacuum cleaner – function – principle – main components – features – types - working – accessories - filters – repairing. washing machine – function – types – semi and fully automatic – top and front loading – washing technique – working cycle – construction and working of washing machine – comparison of top and front-loading machines – problems and remedies.

UNIT V ELECTRIC FAN & HAIR DRIER 7 HOURS

Fan – function – terminology – construction and working of ceiling & table fans –exhaust fan – general fault and remedy. hair drier – function – types – construction and working – safety features – repairs & remedies.

TOTAL:36 HOURS

TEXT BOOKS:

1. *Electrical Practical, Directorate General of employment & training (DGET)*,(2018) .Arihant Publisher.
2. *Handbook of Repair and Maintenance of Domestic Electronics Appliances handbook* By Shashi Bhushan Sinha, BPB Publications.

REFERENCE BOOKS:

1. Dixon and Graham, *Electrical Appliance Manual–Hardcover*, ISBN 13: 9781859608005.
2. Graham and Dixon, (1995). *Electrical Appliances: The Complete Guide to the Maintenance and Repair of Domestic Electrical Appliances* (Haynes for Home DIY S.).
3. Shashi Bhushan Sinha, *Handbook of Repair and Maintenance of Domestic Electronics Appliances.*

WEBSITES:

1. https://alison.com/courses?query=Electrical%20Appliance%20and%20Servicings#.
2. https://www.scribd.com/document/269725441/Electrical-Appliances-PDF.
3. https://www.unitec.ac.nz/career-and-study-options/electrical-and-electronics-engineering/electrical-appliance-serviceperson-eas.

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	-	-	3	-	-	-	-	-	1	-	2	-	2	-	-	2	-
CO2	-	-	3	-	1	-	-	-	1	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	1	2	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-		2	-	-	-	-	-	2	-	-	-	2
CO5	3	-	3	-	-	-	-	-	-	-	2	-	-	-	-	-	-
Average	**3**	**-**	**3**	**-**	**1**	**1**	**2**	**-**	**1**	**-**	**2**	**-**	**2**	**-**	**-**	**2**	**2**

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester III

24CHPOE301 INDUSTRIAL CHEMISTRY 3H-2C

Instruction Hours/week:L: 3 T: 0 P: 0 Marks: Internal: 40 External: 60 Total:100

External Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES:

- To gain the comprehensive process of cane sugar and paint production.
- To understand the physical and chemical properties, characteristics, and the manufacturing processes of glass and cement.
- To acquire the knowledge of rubber fabrication.

COURSE OUTCOMES (CO's):

Upon completion of this course, the student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Illustrate comprehensive process of cane sugar production.	Understand
CO2	Apply the knowledge of paint classification, constituents and diverse applications.	Apply
CO3	Examine the physical and chemical properties of glass.	Analyze
CO4	Analyze the manufacturing processes of cement, including the wet and dry processes,	Analyze
CO5	Explain the rubber fabrication, including refining processes, fabrication methods, and vulcanization techniques.	Evaluate

UNIT I SUGAR **8 HOURS**

Introduction, Manufacture of Cane Sugar - Extraction of juice, Purification of Juice, Defecation, Sulphitation, Carbonation, Concentration or Evaporation. Crystallization -Separation of crystals, drying, refining, recovery of sugar from Molasses, Bagasse. Manufacture of sucrose from beet root. Estimation of sugar, double sulphitation process, double carbonation.

UNIT II PAINTS **8 HOURS**

Classification, constituents, setting of paints, requirements of a good paint. Emulsion, Latex, Luminescent, Fire retardant and Heat resistant paints. Methods of applying paints. Special applications and failures of paint. Varnishes - Introduction – Raw materials – Manufacture of varnishes.

UNIT III GLASS **8 HOURS**

Introduction, Physical/Chemical properties, Characteristics of glass. Raw materials, methods of manufacture - formation of batch material, melting, shaping, annealing and finishing of glass.

UNIT IV CEMENT **6 HOURS**

Introduction, raw materials, manufacture – Wet process, Dry process, reactions in kiln, setting of cement, properties and uses of cement. Plaster of Paris, Gypsum, Lime.

UNIT V RUBBER **6 HOURS**

Introduction, Importance, types and properties of rubber. Refining of crude rubber, drawbacks of raw rubber. Rubber fabrication, vulcanization techniques**.**

TOTAL: 36 HOURS

TEXT BOOKS:

1. Sharma, B.K. (2014). *Industrial Chemistry* ,14th Edition, Meerut: Goel Publishing House.
2. Vermani, O.P and Narula, A.K. (2016*). Industrial Chemistry*. Delhi:Galgotia Publications Pvt Ltd.

REFERENCE BOOK:

1. Jain, P.C. and Monika Jain. (2016). *Engineering Chemistry* ,16th Edition, New Delhi: Dhanpat Rai Publishing Co. (Pvt) Ltd.

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	3	-	-	2	-	-	-	-	2	-	1	-	-	2	-	2	-
CO2	3	-	-	2	-	-	-	-	2	-	1	-	-	-	-	2	-
CO3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	-	-	-	2	-	-	-	-	2	-	1	-	-	1	-	3	-
CO5	2	-	-	2	-	-	-	-	2	-	1	-	-	1	-	2	-
Average	2.5	-	-	2	-	-	-	-	2	-	1	-	-	1.3	-	2.4	-

1-Low, 2-Medium, 3-High, '-' - No Correlation

24MBPOE301 FERMENTATION TECHNOLOGY 3H–2C

Instruction Hours/week: L:3 T:0 P:0 **Marks:** Internal**:40** External**:60** Total**:100**

End Semester Exam: 3 Hours

PREREQUISITE:

Not required

COURSE OBJECTIVES (CO):

- To study the use of microorganisms in the manufacture of food or industrial productson the basis of employment.
- To gain knowledge on design of bioreactors, factors affecting growth and production, heat transfer and oxygen transfer
- To understand the rationale in medium formulation; design for microbial fermentation, and sterilization of medium and air.

COURSE OUTCOMES (COs):

Upon completion of this course students will be able to

COs	Course Outcomes	Blooms Level
CO1	Acquire knowledge in the production of industrial product, and gain knowledge in fermentation components and types	Understand
CO2	Isolate, preserve the microbes for fermentation upstream processes	Apply
CO3	Apply techniques for microbial production of various enzymes	Apply
CO4	Experiment with production of organic acids and beverages	Apply
CO5	Practice the techniques for the production of amino acids, vitamins and single cell proteins	Apply

UNIT I BASICS OF FERMENTATION PROCESSES 7 HOURS

Definition, scope, history, and chronological development of the fermentation industry. Component parts of the fermentation process. Component parts of fermentation process.Microbial growth kinetics, batch and continuous, direct, dual or multiple fermentations; scale up of fermentation, comparison of batch and continuous culture as investigative tools, examples of the use of fed batch culture.

UNIT II ISOLATION AND PRESERVATION 7 HOURS

Isolation, preservation, and strain improvement of industrially important microorganisms. Use of recombination system (Parasexual cycle, protoplast fusion techniques), application of recombinant strains, and the development of new fermentation products.

UNIT III SCREENING AND INOCULUM DEVELOPMENT **7 HOURS**

Screening (primary and secondary screening); detection and assay of fermentation products (Physico-chemical assay, biological assays). Inoculum development, criteria for transfer of inoculum, development of inoculum: Bacteria, Fungi and Yeast.

UNIT IV MICROBIAL PRODUCTION **7 HOURS**

Fermentation type reactions (Alcoholic, bacterial, mixed acid, propionic acid, butanediol and acetone-butanol). Microbial production of enzymes (amylases, Proteases, cellulases) primary screening for producers, large scale production. Immobilization methods.

UNIT V ALCOHOLS AND BEVERAGES **8 HOURS**

Fermentative production of industrial alcohol, production of beverages. Production of organic acids: citric acid, amino acids: glutamic acid, production of vitamins. fungal enzymes and Single cell protein.

TOTAL: 36 HOURS

TEXT BOOKS:

1.Sridhar, S. (2010). *Industrial Microbiology*, Dominant Publishers, New Delhi.

2.Tanuja. S and Purohit, S.S. (2008). *Fermentation Technology*, Agrobios Publication, Jodhpur, India.

3.Harider, S.I. and Ashok, A. (2009). *Biotechnology, A Comprehensive Training Guide for the Biotechnology Industry*, CRC Press, New York.

REFERENCE BOOKS:

1.Casida, L.E. (2007). *Industrial microbiology*, New age international (P) Ltd., New Delhi.

2.Clark, D.P and Pazdernik, N.J. (2009). *Biotechnology applying the genetic revolution*, Elsevier Academic Press, UK.

3.Glazer, A and Nikaido. (1995). *Microbial biotechnology fundamentals of applied microbiology*,W. H. Freeman and company, USA.

4.Glick, B.R and Pasternak, J.J. (2003). *Molecular Biotechnology Principles and Applications of Recombinant DNA*, 3rd edition, ASM Press, USA.

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	P
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
CO3	2	-	-	-	-	-	-	3	-	-	-	-	-	-	-	
CO4	-	-	-	2	-	2	-	3	-	-	2	-	-	-	-	
CO5	-	-	-	2	-	2	-	3	-	-	2	-	-	-	2	
Average	**2.7**	**-**	**-**	**2**	**-**	**2**	**-**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**2**	

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation

Semester - III

24BTPOE301 **NUTRITION AND DIETETICS** **3H–2C**

Instruction Hours/week: L:3 T:0 P:0 **Marks:** Internal: **40** External: **60** Total: **100**

End Semester Exam: 3 Hours

PREREQUISITE: Student should know about basics of food, its nutrients and their relationship to health

COURSE OBJECTIVES (CO)

The main objectives of the course are

- To understand the fundamentals of food, nutrients and their relationship to health
- To respect to deriving maximum benefit from available food resources
- To understand of the consequences of vitamin and mineral deficiency/excess of vitamin
- To learn about the nutrition in adult age
- To develop knowledge on nutrition deficiency diseases and their consequences
- To know about food adulteration and prevention of food adulteration

COURSE OUTCOMES (COs)

On completion of the course, students are able to

COs	Course Outcomes	Blooms Level
CO1	Name the fundamentals of nutrition and their relationship to health	Remember
CO2	Learn to derive maximum benefits from available food resources	Understand
CO3	Identify the consequences of vitamin and mineral deficiency/excess of vitamin	Apply
CO4	Analyze the importance of nutrition in adult age	Analyze
CO5	Assess about nutrition deficiency diseases and their consequences	Evaluate

UNIT I BASIC CONCEPTS IN FOOD AND NUTRITION **5 HOURS**

Understanding relationship between food, nutrition and health, Functions of food-Physiological, psychological and social. Dietary guidelines for Indians and food pyramid

UNIT II NUTRIENTS **5 HOURS**

Functions, dietary sources and clinical manifestations of deficiency/ excess of the following nutrients: Carbohydrates, lipids and proteins, Fat soluble vitamins-A, D, E and K, Water soluble vitamins – thiamin, riboflavin, niacin, pyridoxine, folate, vitamin B12 and vitamin C, Minerals – calcium, iron and iodine

UNIT III NUTRITION DURING THE ADULT YEARS **10 HOURS**

Physiological changes, RDA, nutritional guidelines, nutritional concerns and healthy food choices - Adult, Pregnant woman, Lactating mother, Elderly. Nutrition during childhood -Growth and development, nutritional guidelines, nutritional concerns and healthy food choices -Infants, Preschool children, School children, Adolescents. Nutritional needs of nursing mothers and infants, determinants of birth weight and consequences of low birth weight, Breast feeding, Assessment and management of moderate and severe malnutrition among children, Child health and morbidity, neonatal, infant and child mortality

UNIT IV INTRODUCTION TO NUTRITIONAL DEFICIENCY DISEASES **6 HOURS**

Causes, symptoms, treatment, prevention of the following: Protein Energy Malnutrition (PEM), Vitamin A Deficiency (VAD), Iron Deficiency Anemia (IDA), Iodine Deficiency Disorders (IDD), Zinc Deficiency, Flurosis Nutritional needs during pregnancy, common disorders of pregnancy (Anemia, HIV infection, Pregnancy induced hypertension), relationship between maternal diet and birth. Maternal health and nutritional status, maternal mortality and issues relating to maternal health.

UNIT V DIETETICS **10 HOURS**

Dietary and stress management. Dietary recommendations of WHO. Diet for diabetes mellitus-Nutrition recommendations for patient with diabetes, Meal planning, Diet for Cardiovascular Diseases -Dietary management and general guidelines for coronary heart disease, Diet for cancers at various sites in the human body, diet therapy, managing eating problems during treatment. Hormonal imbalance - Poly cystic ovarian syndrome, causes of hormonal imbalance. Diet management.

Total : 36 Hours

TEXT BOOKS:

1. Srilakshmi.B. (2015) Food Science:. New Age International (P) Ltd. Publishers. 6nd Edition., New Delhi
2. Swaminathan.M. (2008). Essential of Food and Nutrition Vol II The Bangalore Printing and Publishing Co. Ltd., Bangalore.

REFERENCE BOOKS:

1. Garrow,J.S., and James, W.P.T.,(2000). *Human Nutrition & Dietetics*, Longman Group, UK.
2. Gordon M, Wardlaw and Paul M. (2012). *Perspectives in Nutrition*: U.S.A. McGraw Hill Publishers. 9rd Edition. New Delhi
3. Sharma, R (2004). *Diet Management*,3rdEdition, Reed Elsevier India Private Limited, Chennai.
4. Srilakshmi.B. (2014). Nutrition Science, 4th Edition, New Age International (P) Ltd. Publishers. New Delhi.

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	2	2	-	2	2	2	-	2	2	-	2
CO2	3	-	-	-	-	-	-	2	2	-	2	2	2	-	2	2	-	2
CO3	3	-	-	-	-	-	-	2	2	-	2	2	2	-	2	2	-	2
CO4	3	-	-	-	-	-	-	2	2	-	2	2	2	-	2	2	-	2
CO5	3	-	-	-	-	-	-	2	2	-	2	2	2	-	2	2	-	2
Avg	3	-	-	-	-	-	-	2	2	-	2	2	2	-	2	2	-	2

1-Low; 2-Medium; 3-Strong; '-' No correlation