

M.Sc. COMPUTER SCIENCE
CHOICE BASED CREDIT SYSTEM (CBCS)

Curriculum and Syllabus

Regular (2024 – 2025)



DEPARTMENT OF COMPUTER SCIENCE
FACULTY OF ARTS, SCIENCE, COMMERCE AND MANAGEMENT

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.

Tamil Nadu, India

Phone No. 0422-2980011 – 14 Fax No. 0422-2980022-23

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FACULTY OF ARTS, SCIENCE, COMMERCE AND MANAGEMENT

POST – GRADUATE PROGRAMMES

(REGULAR PROGRAMME)

REGULATIONS

(2024)

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FACULTY OF ARTS, SCIENCE, COMMERCE AND MANAGEMENT POST GRADUATE PROGRAMMES (M.Sc. M. Com and M.A)

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 Post Graduate (PG) Degree programmes 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

The various P.G. Programmes offered by the KAHE are listed in the table below.

S. No.	Programmes Offered
1	M.Sc. Biochemistry
2	M.Sc. Microbiology
3	M.Sc. Biotechnology
4	M.Sc. Physics
5	M.Sc. Chemistry
6	M.Sc. Mathematics
7	M.Sc. Computer Science
8	M.Com.
9	M.A. English

1.2. MODE OF STUDY

All programmes are 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 Master's Degree Programme shall be required to have passed an appropriate Degree Examination of this Karpagam Academy of Higher Education or any other University accepted by the KAHE as equivalent thereto. Admission shall be offered only to the candidates who possess the qualification prescribed against each course as given in the table below.

QUALIFICATIONS FOR ADMISSION

S. No.	Programme	Eligibility
1	M.Sc. Biochemistry	B.Sc. Degree with Biology / Biochemistry / Chemistry / Biotechnology / B.F.Sc. / Polymer Chemistry / Microbiology/ Zoology / Botany / Plant Science / Plant Biotechnology / Animal Science / Animal Biotechnology / B.Pharm / Industrial Chemistry / Applied Microbiology / Medical Microbiology / Human Genetics / Medical Genetics / Molecular Biology / Genetics Technology / Environmental Science / Environment Biotechnology / Genetics Engineering / Bioinformatics / Plant Biology & Biotechnology / Animal Cell & Biotechnology / Agriculture / Medical Lab Technology / Nutrition & Dietetics
2	M.Sc. Microbiology	B.Sc. Microbiology / Applied Microbiology / Industrial Microbiology / Medical Microbiology / Botany / Zoology / Biology / Biotechnology / Industrial Biotechnology/ Molecular Biology / Genetic Engineering / Biochemistry / Agriculture / Forestry / Medical Lab Technology / Life Sciences

3	M.Sc. Biotechnology	B.Sc. Degree with Biotechnology/ Industrial Biotechnology/ Biology / Biochemistry / B.Sc Biology with Chemistry Ancillary / B.F.Sc. / Microbiology / Zoology / Botany / Plant Science /Plant Biotechnology / Animal Science /Animal Biotechnology / B.Pharm / Applied Microbiology / Medical Microbiology / Human Genetics / Medical Genetics / Molecular Biology / Genetics / Environmental Science / Environment Biotechnology / Genetics Engineering / Bioinformatics / Plant Biology & Biotechnology / Animal Cell & Biotechnology / Agriculture / B.Tech (Biotech)
4	M.Sc. Physics	B.Sc. Physics, B.Sc. Physics (CA) / B.Sc. Applied Sciences
5	M.Sc. Chemistry	B.Sc. Chemistry, Industrial Chemistry, Polymer Chemistry, B.Sc. Applied Sciences
6	M.Sc. Mathematics	B.Sc. Mathematics / B.Sc. Mathematics with Computer Applications, B.Sc. Applied Sciences
7	M.Sc. Computer Science	B.Sc. Computer Science / B.Sc Computer Science (Cognitive Systems)/ B.Sc Computer Science (AI&DS)/ B.Sc Computer Science (Cyber Security)/ Computer Technology / Information Technology / Electronics / Software Systems / BCA/ B.Sc. Applied Sciences
8	M.Com	B.Com. / B.Com.(CA) /B.Com (PA) / B.Com (Finance & Insurance) / B.Com. (e-Commerce) / B.Com.(IT) / B.B.M. /B.B.M. (CA) / B.B.A./ B.B.A (CA) / B.Com (CS), B.A. Co-operation / Bachelor's Degree in Bank Management/ B.A. Economics / B. Com Financial Analytics/ B. Com International Accounting and Finance
9	MA English	BA (English)/Any UG degree with Part II – English for four semesters.

2. DURATION OF THE PROGRAMMES

- 2.1. The minimum and maximum period for completion of the P.G. Programmes are given below:

Programme	Min. No. of Semesters	Max. No. of Semesters
M.Sc., M.Com., MA	4	8

- 2.2. Each semester normally consists of 90 working days or 450 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. All PG programmes are offered under Choice Based Credit System and students can earn a total of 92 credits.

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 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 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. 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 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	M.Sc., M.Com., M.A	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	<i>Viva – voce</i> [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.	<i>Viva – voce</i> [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.

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

$$\text{i.e. GPA of a Semester} = \frac{\sum_i C_i G P_i}{\sum_i C_i}$$

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

$$\text{CGPA of the entire programme} = \frac{\text{Sum of the product of the GP by the corresponding credits of the courses offered in that Semester}}{\text{Sum of the credits of the courses of that Semester}}$$

Sum of the credits of the courses of the entire programme

$$\text{i.e. CGPA of the entire programme} = \frac{\sum_n \sum_i C_{ni} GP_{ni}}{\sum_n \sum_i C_{ni}}$$

where,

C_i is the credit fixed for the course 'i' in any semester

GP_i 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-totalling 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.

Annexure I

S.No.	Programme	Subject	Eligibility
1.	B. Sc.	Biotechnology	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern taking Biology or Botany or Zoology or chemistry as subjects at the Higher Secondary level.
2.	B. Sc.	Computer Science	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern. preferably taking Mathematics/Statistics/Computer/Information Science being one of the subjects (OR) 3 year diploma after 10 th or 10+2 pattern of education taking computer science/maths as one of the subject.
3.	B. Sc.	Microbiology	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern taking Biology or Botany Zoology or chemistry as subjects at the Higher Secondary level.
4.	B. Sc.	Information Technology	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern preferably taking Mathematics/Statistics/Computer/Information Science being one of the subjects (OR) 3 year diploma after 10 th or 10+2 pattern of education taking computer science/maths as one of the subject.
5.	B. Sc.	Computer Technology	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern preferably taking Mathematics/Statistics/Computer/Information Science being one of the subjects (OR) 3 year diploma after 10 th or 10+2 pattern of education taking computer science/maths as one of the subject.
6.	B.Sc.	Computer Science(Cognitive Systems)	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern preferably taking Mathematics/Statistics/Computer/Information Science being one of the subjects (OR) 3 year diploma after 10 th or 10+2 pattern of education taking computer science/maths as one of the subject.

7.	B.Sc.	Computer Science (Artificial Intelligence and Data Science)	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern preferably taking Mathematics/Statistics/Computer/Information Science being one of the subjects (OR) 3 year diploma after 10 th or 10+2 pattern of education taking computer science/maths as one of the subject.
8.	BCA	Computer Application	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern preferably taking Mathematics/Statistics/Computer/Information Science being one of the subjects (OR) 3 year diploma after 10 th or 10+2 pattern of education taking computer science/maths as one of the subject.
9.	B. Com.	Commerce	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern Commerce as a subject under the academic or vocational stream at the Higher Secondary level
10.	B.Com (CA)	Commerce with Computer Applications	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern Commerce as a subject under the academic or vocational stream at the Higher Secondary level
11.	B. Com. (PA)	Commerce with Professional Accounting	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern Commerce as a subject under the academic or vocational stream at the Higher Secondary level
12.	B. Com. (BPS)	Commerce with Business Process Services	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern Commerce as a subject under the academic or vocational stream at the Higher Secondary level
13.	B.B.A.	Business Administration	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern Commerce as a subject under the academic or vocational stream at the Higher Secondary level
14.	B. Com	Financial Analytics	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern Commerce as a subject under the academic or vocational stream at the Higher Secondary level

15.	B. Com	International Accounting and Finance	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern Commerce as a subject under the academic or vocational stream at the Higher Secondary level
16.	B.Com	Information Technology	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern Commerce as a subject under the academic or vocational stream at the Higher Secondary level
17.	B. Sc.	Computer Science (Cyber Security)	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern preferably taking Mathematics/Statistics/Computer/Information Science being one of the subjects (OR) 3 year diploma after 10 th or 10+2 pattern of education taking computer science/maths as one of the subject.
18.	B. Com	FinTech.	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern Commerce as a subject under the academic or vocational stream at the Higher Secondary level

Karpagam Innovation and Incubation Council (KIIC)

(A Section 8 Company)

Based on the 2019 National Innovation and Startup Policy and the 2019–2023 Tamil Nadu Startup Policy, KIIC has recommended to the KAHE students who are affiliated with the KIIC that it be incorporated in the university Program Regulations 2023-24 and implement from this academic year.

Norms to Student Start-Ups

- a) Any (UG/PG / (Ph.D.) Research scholars, student, right from the first year of their program is allowed to set a startup (or) work part time/ full time in a startup or work as intern in a startup
- b) Any (UG/PG / (Ph.D.) Research scholars) student right from the first year of their program is allowed to earn credit for working on Innovative prototypes/business Models/ Pre incubation (case to case basis).
- c) Start Up activities will be evaluated based on the guidelines being given by the expert committee of the KIIC
- d) Student Entrepreneurs may use the address of incubation center (KIIC) to register their venture while studying in KAHE.
- e) Students engaged in startups affiliated with the KIIC or those who work for them may be exempted from KAHE's attendance requirements for academic courses under current regulations, up to a maximum of 30% attendance per semester, including claims for ODs and medical emergencies Potential Students who have been incubated at KIIC may be permitted to take their University semester exams even if their attendance is below the minimum acceptable percentage, with the proper authorization from the head of the institution. (On case-to-case basis depends upon the applicability strength, societal benefits and quality of the Innovation and Subsequent engagement of the students with the/ her business)
- f) Any Students Innovators/entrepreneurs are allowed to opt their startup in place mini project /major project, /seminar and summer training etc. (In plant training, Internship, value added Course.). The area in which the student wishes to launch a Startup may be interdisciplinary or multidisciplinary.
- g) Student's startups are to be evaluated by Expert committee, formed by KIIC and KAHE

Guide lines to award Credits/ Marks to a Student startup

Student's startup stages are divided into five phases and these startup phases can be considered equally in place of the course title as mentioned below with the same credits allotted to the course title in a University curriculum.

Sl. No.	Description/Startup phases	In place of the Subject / Course title	Grades/Credits /Marks
1	Idea stage/Problem Identification	Seminar	Same Marks/Credits can be awarded that are listed in the course title's curriculum for the respective startup phases.
2	Proof of Concept (POC) /Solution development	In-plant training /Internship	
3	Product Development (Lab scale) /Prototype Model/ Company Registered	Mini Project/ Value added Course	
4	Validation/Testing	Main Project phase I	
5	Business Model/Ready for Commercialization/Implementation	Main Project phase II,	

PROGRAM OUTCOMES (POs):

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 Science.
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 Science.
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 Science.
6. **Research-related skills:** Demonstrate proficiency in data analysis, critical appraisal, and ethical research practices, contributing original insights to the advancements in Computer Science.
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 Science.
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 OUTCOMES (PSOs)

PSO 1: Graduates will be proficient in conducting advanced research in computer science, contributing to the development of new theories, algorithms, or technologies. They will demonstrate the ability to apply research findings to solve complex real-world problems in innovative ways.

PSO 2: Graduates will possess specialized expertise in a focused area of computer science, such as artificial intelligence, cybersecurity, data science, or software engineering. They will demonstrate leadership qualities, guiding teams and projects towards successful outcomes in their specialized field.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO I: Graduates will acquire an in-depth understanding of advanced computer science concepts, enabling them to design, develop, and implement innovative solutions to complex computational problems.

PEO II: Graduates will engage in cutting-edge research, contribute to advancements in computer science, and apply innovative techniques to emerging challenges in the field.

PEO III: Graduates will exhibit leadership and ethical decision-making in professional environments, contributing responsibly to technology development and societal impact.

PEO IV: Graduates will demonstrate a commitment to continuous learning, staying current with evolving technologies, and adapting to new trends in computer science and related fields.

DEPARTMENT OF COMPUTER SCIENCE
FACULTY OF ARTS, SCIENCE, COMMERCE AND MANAGEMENT
PG PROGRAM (CBCS) – M.Sc. Computer Science (2024–2025 Batch and onwards)

Course Code	Name of the course	Category	Outcomes		Instruction hours/week			Credits	Maximum Marks			Page No
			PO	PSO	L	T	P		CIA	ESE	Total	
									40	60	100	
SEMESTER I												
24CSP101	Python Programming	CC	1,3,4,5,7,8,9,11,15	1	4	-	-	4	40	60	100	1
24CSP102	Data Mining Techniques and Tools	CC	1,3,4,5,9,11	1,2	4	-	-	4	40	60	100	4
24CSP103	Critical Thinking, Design Thinking and Problem Solving	CC	1,3,4,5,7,8	1,2	4	-	-	4	40	60	100	7
24CSP104	Cloud Computing	CC	1,3,4,5,7,8,9,11,14,	1,2	4	-	-	4	40	60	100	9
24CSP105	Elective – I *	EC	-	-	4	-	-	4	40	60	100	12
24CSP111	Python Programming - Practical	CC	1,3,4,8,9,11	1,2	-	-	4	2	40	60	100	21
24CSP112	Data Mining Techniques and Tools - Practical	CC	1,3,4,5,11,13	1,2	-	-	4	2	40	60	100	23
Journal Paper Analysis & Presentation		-	-	-	2	-	-	-	-	-	-	
Semester Total					22	-	8	24	280	420	700	

Course Code	Name of the course	Category	Outcomes		Instruction hours/week			Credits	Maximum Marks			Page No
			PO	PSO	L	T	P		CIA	ESE	Total	
									40	60	100	
SEMESTER II												
24CSP201	Web Development using Angular JS & MongoDB	CC	1,3,4,5,7,8,9,11	1,2	4	-	-	4	40	60	100	26
24CSP202	Cyber Security	CC	1,3,4,5,6,8,15	1,2	4	-	-	4	40	60	100	29
24CSP203	Data Science and Analytics	CC	1,3,4,5,6,7,8,11	1,2	4	-	-	4	40	60	100	32
24CSP204	Internet of Things	CC	1,3,4,5,6,11	1,2	4	-	-	4	40	60	100	34
24CSP205	Community Engagement and Social Responsibility	CC	1,2,3,4,5,6,7,8,10,15	2	2	-	-	2	40	60	100	37
24CSP206	Elective – II *	EC	-	-	4	-	-	4	40	60	100	39
24CSP211	Web Development using Angular JS & MongoDB - Practical	CC	1,3,4,5,7,8,9,11	1,2	-	-	3	2	40	60	100	45
24CSP212	Data Science and Analytics – Practical	CC	1,3,4,5,6,11	1,2	-	-	4	2	40	60	100	47
Journal Paper Analysis & Presentation		-	-	-	1	-	-	-	-	-	-	
Semester Total					23	-	7	26	320	480	800	

Course Code	Name of the course	Category	Outcomes		Instruction hours/week			Credits	Maximum Marks			Page No
			PO	PSO	L	T	P		CIA	ESE	Total	
									40	60	100	
SEMESTER III												
24CSP301	J2EE	CC	1,3,5,7,9,11,13,15,	1,2	4	-	-	4	40	60	100	49
24CSP302	Software Testing and Quality Assurance	CC	1,3,4,5,6,7,13	1,2	4	-	-	3	40	60	100	51
24CSP303	Digital Image Processing	CC	1,3,4,6,7	1,2	4	-	-	4	40	60	100	54
24CSP304	Artificial Intelligence and Machine Learning	CC	1,3,4,5,6,8,10	1,2	4	-	-	4	40	60	100	56
24CSP305	Elective – III *	EC	-	-	4	-	-	4	40	60	100	58
24CSP311	J2EE - Practical	CC	1,3,5,7,9,11,13,15	1,2	-	-	3	2	40	60	100	65
24CSP312	Software Testing and Quality Assurance - Practical	CC	1,3,4,5,6,7,13	1	-	-	3	2	40	60	100	67
24XXPOE301	Open Elective *	OE C			3	-	-	2	40	60	100	69
24CSP391	Internship *	-	-	-	-	-	-	2	100	-	100	90
Journal Paper Analysis & Presentation		-	-	-	1	-	-	-	-	-	-	
Semester Total					24	-	6	27	420	480	900	

Course Code	Name of the course	Category	Outcomes		Instruction hours/week			Credits	Maximum Marks			Page No
			PO	PSO	L	T	P		CIA	ESE	Total	
									80	120	200	
SEMESTER IV												
24CSP491	Project and Viva Voce	CC	-	-	-	-	-	15	80	120	200	91
*End of II Semester internship for 15 days												
Semester Total					-	-	-	15	80	120	200	
Program Total					69	-	21	92	1100	1500	2600	

ELECTIVE COURSES

	Course Code	Name of the Course
ELECTIVE – I	24CSP105A	Mobile Computing
	24CSP105B	Cryptography and Network Security
	24CSP105C	Wireless Sensor Networks
ELECTIVE – II	24CSP206A	Statistical Data Analysis
	24CSP206B	Block Chain Technology
	24CSP206C	Deep Learning
ELECTIVE – III	24CSP305A	Augmented Reality
	24CSP305B	Introduction to Robotics
	24CSP305C	Intelligent Agents

LIST OF OPEN ELECTIVE COURSES

S.No.	Name of the offering Department	Course Code	Name of the Course
1	English	24EGPOE301	English for Competitive Examination
2	Commerce	24CMPOE301	Personal Finance and Planning
3	Management	24MBAPOE301	Organizational Behaviour
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

PREREQUISITE:

- Familiarity with using a computer, navigating file systems, and using software applications.
- Basic arithmetic and logic are useful, especially for algorithmic thinking.

COURSE OBJECTIVES (CO):

- To create the basic python programming using expressions and operators
- To understand the fundamental principles of Object-Oriented Programming, as well as data and information processing techniques
- To define the python functions to facilitate code reusability and to create GUI based python applications using Object oriented programming.

COURSE OUTCOMES (COs):

Upon the completion of this course, the students will be able to

COs	Course Outcomes	Blooms Level
CO1	Apply modules for reusability and the object-oriented principles for modeling.	Apply
CO2	Make use of various data structures for solving real world problems.	Apply
CO3	Analyze the concept of string and text files using python programming.	Analyze
CO4	To learn how to build and package Python modules for reusability.	Apply
CO5	Develop simple Python programs for solving problems.	Apply

UNIT I PYTHON OVERVIEW, DATA TYPES, EXPRESSIONS**9 HOURS**

Python programming – variable, Datatype, Keywords, Literals, Operator, Expression, type conversion, Comments, input and output, Strings, Assignment and Comments – Numeric Data Types and Character Sets, Expressions.

UNIT II FUNCTIONS, MODULES AND CONTROL STATEMENTS**9 HOURS**

Functions and Modules-Calling Functions, the math Module, The Main Module, Program Format and Structure and Running a Script from a Terminal Command Prompt – Iteration – for loop – Selection – Boolean Type, Comparisons, and Boolean Expressions, if-else Statements, One-Way Selection Statements, Multi-way if Statements, Logical Operators and Compound Boolean Expressions, Short- Circuit Evaluation and Testing Selection Statements – Conditional Iteration – while loop

UNIT III STRINGS AND TEXT FILES

10 HOURS

Strings-Accessing Characters and Substrings in Strings – Data Encryption – Strings and Number Systems and String Methods-Text Files-Text Files and Format – Writing Text to a File – Writing Numbers to a File – Reading Text from a File – Reading Numbers from a File and Accessing and Manipulating Files and Directories on Disk.

UNIT IV LISTS AND DICTIONARIES

10 HOURS

Lists-List Literals and Basic Operators, Replacing an Element in a List, List Methods for Inserting and Removing Elements, Searching and Sorting a List, Mutator Methods and the Value None, Aliasing and Side Effects, Equality and Tuples – Defining Simple Functions – Syntax, Parameters and Arguments, return Statement, Boolean Functions and main function, Dictionaries-Dictionary Literals – Adding Keys and Replacing Values – Accessing Values, Removing Keys and Traversing a Dictionary.

UNIT V DESIGN WITH FUNCTIONS AND CLASSES, GRAPHICAL USER INTERFACE

10 HOURS

Object Oriented Programming in Python: Classes, ‘self-variable’ Methods, Constructor Method, Inheritance, Overriding Methods, and Data hiding. **Database Programming:** Introduction, Python Database Application Programmer’s Interface (DB-API), Object Relational Managers (ORMs), Related Modules- Connecting to a database, Creating Tables.

Case Study: GUI based ATM.

TOTAL:48 HOURS

TEXT BOOKS:

1. Kenneth A. Lambert, Martin Osborne,(2018) “*Fundamentals of Python: First Programs, Cengage Learning*”, second edition, Cengage Learning, Canada ,ISBN13:978-1337560092.
2. Paul Barry,(2016) “*Head First Python 2e*”, O’Reilly, 2nd Revised edition, ISBN-13: 978- 1491919538.
3. Michal Jaworski, TarekZiade, (2016), “*Expert Python Programming*”, Second Revised edition ,Packt Publishing, ISBN-13: 978-1785886850.

REFERENCE BOOKS:

1. Sam Washington, Dr. M. O. Faruque Sarker,(2015) ,“*Learning Python Network Programming*”, second edition, Packt Publishing Limited, ISBN-13:978-1784396008.
2. Rick Van Hattem, (2016), “*Mastering Python*”, Second Edition ,Packt Publishing, , ISBN 139781786463746.

WEBSITES:

1. www.python.org/about/gettingstarted/
2. www.tutorialspoint.com/python/index.htm
3. www.realpython.com/python-beginner-tips/
4. <https://nptel.ac.in/courses/106/106/106106182/>
5. <https://nptel.ac.in/courses/106106145/>

JOURNALS

1. Kalyani Adawadkar,” **Python Programming-Applications and Future** “, International Journal of Advance Engineering and Research Development, Special Issue SIEICON-2017, April -2017.
2. K. R. Srinath , “**Python – The Fastest Growing Programming Language**”, International Research Journal of Engineering and Technology (IRJET) ,Volume: 04 Issue: 12 , Dec-2017

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	-
CO2	-	-	3	-	-	-	2	3	-	-	2	-	-	-	3	-	-
CO3	-	-	3	-	-	-	-	-	2	-	-	-	-	-	-	-	-
CO4	-	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	1	2	-	2		2	-	-	-	-	-	-	-	-
Average	3	-	3	1	2	-	2	1	2	-	2	-	-	-	3	2	-

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

PREREQUISITE:

- A solid understanding of mathematics is essential for data mining. This includes knowledge of algebra, calculus, probability, and statistics. Mathematical concepts such as linear algebra and optimization are also important for understanding algorithms used in data mining.
- Proficiency in programming is crucial for working with data and implementing data mining algorithms. Common programming languages used in data mining include Python, R, and SQL. You should be comfortable writing code, manipulating data, and using libraries and tools for data analysis.

COURSE OBJECTIVES (CO):

- To understand the concepts of data mining, KDD process, issues and applications.
- To know the working of different data mining techniques and its uses.
- To learn the usage of data mining tools WEKA and R and Understand the difference between Web mining, Text mining and Sequence mining.

COURSE OUTCOMES (COs):

Upon the completion of this course, the students will be able to

COs	Course Outcomes	Blooms Level
CO1	Analyze data mining problems and reason about the most appropriate methods to apply to a given dataset and knowledge extraction need.	Analyze
CO2	Analyze the working of different clustering algorithms.	Analyze
CO3	Apply the basic concepts of Association Rule Mining and evaluate the working of various Association Rule Mining algorithms	Apply
CO4	Distinguish the difference between Web mining, Text mining and Sequence mining	Analyze
CO5	Analyze the working of WEKA and R Tools	Analyze

UNIT I DATA MINING**9 HOURS**

Introduction – Definitions - KDD vs. Data Mining – Data Mining Techniques – Issues and Challenges in Data Mining – Data Mining Application Areas. Classification Technique: Introduction – Decision Trees: Tree Construction Principle - Decision Tree Construction Algorithm – CART – ID3 – Rainforest – CLOUDS

UNIT II CLUSTERING TECHNIQUES**10 HOURS**

Clustering Paradigms – Partitioning Algorithm - K-Means – K-Medoid Algorithms – CLARA – Hierarchical Clustering - DBSCAN – BIRCH – Categorical Clustering Algorithms – STIRR - Other Techniques. Introduction to Neural Networks - Learning in Neural Networks –

Unsupervised Learning - Genetic Algorithm.

UNIT III ASSOCIATION RULES

10 HOURS

Concepts - Methods to Discover Association Rules - Apriori Algorithm – Partition Algorithm -Dynamic Item Set Counting Algorithm - FP-Tree Growth Algorithm - Incremental Algorithm - Generalized Association Rule.

UNIT IV WEB MINING

9 HOURS

Basic Concepts – Web Content Mining – Web Structure Mining – Web Usage Mining – Text Mining: Text Clustering - Sequence Mining: The GSP Algorithm – SPADE.

UNIT V TOOLS

10 HOURS

Tools: Need for Data Mining Tools - Introduction to WEKA – The Explorer – The Experimenter – Classification – Regression – Clustering - Nearest Neighbor - Introduction to R - Data Types-Variables Operators - Decision Making - Loop Control – Function – Strings - Vectors - Lists-Matrices – Arrays – Factors - Data Frames – Packages - Charts and graphs – Statistics - Discussion on Case Study - Expert Lectures - Online Seminars – Webinars – Workshops.

TOTAL:48 HOURS

TEXT BOOKS:

1. Arun K. Pujari, (2009), “*Data Mining Techniques*”, Third Edition, Universities Press (India) Limited. Hyderabad.
2. Margaret H. Dunham,(2004) “*Data Mining Introductory and Advanced Topics*”, Second Edition, Pearson Education, Hyderabad.
3. Ian H. Witten, Eibe Frank, Mark A. Hall, (2011), “*Data Mining: Practical Machine Learning Tools and Techniques*”. Elsevier.
4. Norman Matloff,(2011) , “*The Art of R Programming a Tour of Statistical Software Design*”, Third Edition,William Pollock, San Fransisco.
5. Emmanuel Paradis,(2005), “*R for Beginners*”, Second Edition,Institutes Sciences Evolution.

REFERENCE BOOKS:

1. Pieter Adriaans, Dolf Zantinge,(2008), “*Data Mining*”, Second Edition,Addison Wesley.
2. Jaiwei Han and Micheline Kamber,(2011), “*Data Mining Concepts and Techniques*”, 3rd Edition, Morgan Kaufmann Publishers.
3. Dr. Matthew A. North,(2012) “*Data Mining for the Masses*”, ,3rd Editoin, A Global Text Project Book, , Pearson Education .
4. Roger D. Peng,(2015), “*R Programming for Data Science*”, Third Edition,Lean Publishing.

WEBSITES:

1. https://swayam.gov.in/nd2_cec20_cs12/preview
2. https://onlinecourses.nptel.ac.in/noc19_ma33/preview
3. <https://www.futurelearn.com/courses/data-mining-with-weka>
4. https://onlinecourses.nptel.ac.in/noc21_cs06/preview
5. <https://www.coursera.org/specializations/data-mining>
6. <https://www.mygreatlearning.com/academy/learn-for-free/courses/data-mining>

JOURNALS

1. Dr. Malla Reddy Jogannagari, Mrs. Maheshwari Manchala,” **Data Mining: Techniques, Tools and its Challenges** “, International Journal of Creative Research Thoughts (IJCRT) www.ijcrt.org, © 2020 IJCRT | Volume 8, Issue 7 July 2020 | ISSN: 2320-2882.

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	2	-	3	-	-	-	-	-	-	-	1	-	-	-	-	3	-
CO2	-	-	-	3	1	-	-	-	-	-	-	-	-	-	-	-	2
CO3	-	-	-	3	-	-	-	-	1	-	-	-	-	-	-	-	-
CO4	2	-	3	-	1	-	-	-	-	-	-	-	-	-	-	-	-
CO5	2	-	3	3	1	-	-	-	-	-	-	-	-	-	-	-	-
Average	2	-	3	3	1	-	-	-	1	-	1	-	-	-	-	3	2

1 - Low, 2 - Medium, 3 - High, ‘-’; - No Correlation

PREREQUISITE:

- Not Required.

COURSE OBJECTIVES (CO):

- Learn critical thinking and its related concepts
- Learn design thinking and its related concepts
- Develop Thinking patterns, Problem solving & Reasoning

COURSE OUTCOMES (COs):

Upon the completion of this course, the students will be able to

COs	Course Outcomes	Blooms Level
CO1	Identify appropriate Problem-solving and Decision-making processes	Apply
CO2	Focus on the explicit development of critical thinking and problem solving skills	Apply
CO3	Apply design thinking in problems	Analyze
CO4	Analyze a problem and identify the root cause.	Analyze
CO5	Analyze the concepts of Thinking patterns, Problem solving & Reasoning in real time applications	Analyze

UNIT I CRITICAL THINKING**10 HOURS**

Critical Thinking: Definition, Conclusions and Decisions, Beliefs and Claims, Evidence – finding, evaluation, Inferences, Facts – opinion, probable truth, probably false, Venn diagram. Applied critical thinking: Inference, Explanation, Evidence, Credibility, Two Case Studies, critical thinking and science, critical evaluation, self assessment.

UNIT II DESIGN THINKING**10 HOURS**

Design Thinking: Introduction, Need of Design Thinking, problem to question - design thinking process, Traditional Problem Solving versus Design Thinking, phases of Design Thinking, problem exploration, Stake holder assessment, design thinking for manufacturers, smart Idea to implementation.

UNIT III CASE STUDY**10 HOURS**

Thinking to confidence, fear management, duty Vs passion, Team management, Tools for Thinking, prototype design, Relevance of Design and Design Thinking in engineering, human centered design, case study: apply design thinking in problem

UNIT IV PROBLEM SOLVING**9 HOURS**

Problem solving: problem definition, problem solving methods, selecting and using information, data processing, solution methods, solving problems by searching, recognizing patterns, spatial reasoning, necessity and sufficiency, choosing and using models, making choices and decisions.

UNIT V REASONING**9 HOURS**

Reasoning: Deductive and hypothetical reasoning, computational problem solving; generating, implementing, and evaluating solutions, interpersonal problem solving. Advanced problem solving: Combining skills – using imagination, developing models, Carrying out investigations, Data analysis and inference. Graphical methods of solution, Probability, tree diagrams and decision trees. Expert lectures, online seminars – webinars

TOTAL:48 HOURS

TEXT BOOKS:

1. John Butterworth and Geoff Thwaites,(2013), “*Thinking skills: Critical Thinking and Problem Solving*”, Cambridge University Press.
2. .H. S. Fogler and S. E. LeBlanc,(2008), “*Strategies for Creative Problem Solving*”, 2nd edition, Pearson, Upper Saddle River, NJ.
3. Whimbey and J. Lochhead,(1999), “*Problem Solving & Comprehension*”, 6th edition, Lawrence Erlbaum, Mahwah, NJ.

REFERENCE BOOKS:

1. M. Levine,(1994), “*Effective Problem Solving*”, 2nd edition, Prentice Hall, Upper Saddle River, NJ.
2. Michael Baker, (2015), “*The Basic of Critical Thinking, The Critical Thinking*”, 2nd edition ,Co press.
3. David Kelley and Tom Kelley,(2013), “*Creative Confidence*”. 2nd edition, Co press.

WEBSITES:

1. https://www.tutorialspoint.com/critical_thinking/index.htm
2. https://www.tutorialspoint.com/design_thinking/design_thinking_quick_guide.htm
3. <https://nptel.ac.in/courses/109104109>

JOURNAL

1. .Matthee, Machdel and Turpin, Marita "**Invited Paper: Teaching Critical Thinking, Problem Solving, and Design Thinking: Preparing IS Students for the Future,**" *Journal of Information Systems Education*: 2019 Vol. 30 : Iss. 4 , 242-252.

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	-	3	-	-	-	2	-	-	-	-	-	-	-	-	-	2
CO3	-	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	2	-	-	-	-	-	-	-	-	-	-
CO5	-	-	3	3	3	-	-	1	-	-	-	-	-	-	-	-	-
Average	1	-	3	3	3	-	2	1	-	-	-	-	-	-	-	3	2

1 - Low, 2 - Medium, 3 - High, ‘-’; - No Correlation

PREREQUISITE:

- Understanding basic networking concepts such as IP addresses, DNS, routers, and firewalls can be helpful in grasping cloud networking concepts.
- Familiarity with cloud services.

COURSE OBJECTIVES (CO):

- To provide a good understanding of the concepts, standards in Cloud computing
- To make the student understand about the cloud service providers and their usage.
- To learn how to secure the data in cloud depending.

COURSE OUTCOMES (COs):

Upon the completion of this course, the students will be able to

COs	Course Outcomes	Blooms Level
CO1	Utilize the recent trends in the field of cloud computing and providing exposures to some open source and commercial clouds.	Apply
CO2	Identify the architecture of the cloud and the usage of clouds.	Apply
CO3	Analyze the secure data from the security issues.	Analyze
CO4	Develop the students to work based on the various service level agreements.	Apply
CO5	Apply the traditional cloud and Microsoft azure, etc.	Apply

UNIT I INTRODUCTION To CLOUD COMPUTING**10 HOURS**

Characteristics of Cloud Computing -Paradigm shift - Benefits of cloud computing - Disadvantages of cloud computing- Role of Open Standards-Cloud Computing Architecture: Cloud computing stack-Public cloud -Private cloud -Hybrid cloud -Community cloud

UNIT II SERVICE MODELS**10 HOURS**

Infrastructure as a Service (IaaS) -Platform as a Service (PaaS) -Software as a Service (SaaS) - Identity as a Service (IdaaS) -Compliance as a Service (CaaS)- Cloud storage- Advantages of Cloud Storage – Cloud Storage Providers.

UNIT III VIRTUALIZATION TECHNOLOGIES**10 HOURS**

Load Balancing and Virtualization -Advanced load balancing -The Google cloud - Hypervisors - Virtual machine types -VMware vSphere - Machine Imaging -Porting Applications -The Simple Cloud API - AppZero Virtual Application Appliance. Virtualization of CPU –Memory – I/O Devices –Virtualization Support and Disaster Recovery.

UNIT IV CLOUD INFORMATION SECURITY OBJECTIVES

10 HOURS

Confidentiality Integrity and Availability -Cloud Security Services - Relevant Cloud Security Design Principles -Cloud Computing Risk Issues -The CIA Triad Privacy and Compliance Risks -Threats to Infrastructure Data and Access Control -Cloud Access Control Issues -Database Integrity Issues -Cloud Service Provider Risks Architectural Considerations General Issues- Trusted Cloud Computing -Identity Management and Access Control

UNIT V DATACENTER

8 HOURS

Datacenter: Data center overview -Components - Provisions - Need of Data Center - Data Center Architecture - Different Racks - Data center architecture for cloud computing - role of data center in cloud computing.

Case Studies

Case Study on Open Source and Commercial Clouds: Microsoft Azure- Amazon EC2-Google Web services – Open Nebula.

TOTAL:48 HOURS

TEXT BOOKS:

1. Dr Kumar Saurabh.(2018), “*Cloud Computing*” .2ndediton. New Delhi: Wiley India.
2. Nikos Antonopoulos, Lee Gillam. (2018). “*Cloud Computing: Principles Systems and Applications*”. Springer.
3. Giovanni Toraldo. (2017). “*Open Nebula 3 Cloud Computing*”. 2ndediton ,Wiley, New Delhi, India
4. Barrie Sosinsky .(2017). “*Cloud Computing Bible*” . 1stediton Wiley- New Delhi, India

REFERENCE BOOKS:

1. Rajkumar Buyya, James Broberg, & Andrzej, M. Goscinski. (2017). “*Cloud Computing Principles and Paradigms*”, 3rdediton, New Delhi: Tata Mc-Graw Hill.
2. Ronald, L. Krutz, Russell Dean Vines. (2016). “*Cloud Security: A Comprehensive Guide to Secure Cloud Computing*”, 3rdediton ,Wiley New Delhi ,India,
3. Anthony T.Velte Toby J.Velte Robert Elsenpeter. (2016).” *Cloud Computing Practical Approach*” ,first edition, Tata McGraw Hill. New Delhi

WEBSITES:

1. en.wikipedia.org/wiki/Cloud_computing
2. www.ibm.com/cloud-computing/in/en/
3. www.oracle.com/CloudComputing
4. www.microsoft.com/en-us/cloud/default.aspx
5. <https://nptel.ac.in/courses/106105167/>

JOURNALS

1. K.Naresh, P.Leela, P.Suneetha, Purandhar.N ,” **Research on Cloud Computing By using SaaS Model** “,International Journal of Recent Technology and Engineering (IJRTE), Volume-8, Issue-1S4, June 2019

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	2	-	3	3	-	-	-	-	-	-	3	-	-	-	-	3	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
CO3	-	-	3	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	3	3	2	-	3	-	-	2	-	-	-
CO5	-	-	3	-	-	-	3	-	-	-	3	-	-	-	-	-	-
Average	2	-	3	3	1	-	3	3	2	-	3	-	-	2	-	3	2

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

PREREQUISITE:

- Basic knowledge of Computer fundamentals and networking.

COURSE OBJECTIVES (CO):

- To define the concepts and technology of wireless communication in mobile computing fielding.
- To describe the principles of networking that support connectivity to cellular networks, wireless internet and sensor devices.
- To explain the techniques involved in the functioning of Mobile Adhoc Networks

COURSE OUTCOMES (COs):

Upon the completion of this course, the students will be able to

COs	Course Outcomes	Blooms Level
CO1	Analyze the architecture, merits and demerits of Wireless technologies like Infra- Red Bluetooth, Wi-Fi, RFID and Wi-Max	Analyze
CO2	Analyze various cloud programming models and apply them to solve problems on the cloud.	Analyze
CO3	Compare the characteristics and techniques MANET with VANET	Analyze
CO4	Analyze technology of 1G,2G, 3G and 4G for gaining the working knowledge of four generation wireless technologies.	Analyze
CO5	Apply the features of Android programming for developing Android Applications	Apply

UNIT I INTRODUCTION**10 HOURS**

Mobile Computing- Middleware and Gateways-Developing Mobile Computing Applications- Mobile Computing Vs Wireless Networking - Characteristics of Mobile computing -Security in Mobile Computing – Architecture of Mobile Computing – Three–Tier Architecture – Design Consideration for Mobile Computing – Mobile Computing through Internet – Mobile Computing through Telephone-Developing an IVR Applications

UNIT II BLUETOOTH AND GSM**10 HOURS**

Bluetooth- Features and working of RFID -Wireless Broadband (WiMax)- Mobile IP – IPV6- IPV4 Vs IPV6 –Global System for MobileCommunications–GSM Architecture–CallRouting inGSM – GSM Addressesand Identifiers–NetworkAspectsinGSM–GSMFrequencyAllocation– Authenticationand Security- Mobile Computing Over SMS – SMS-ValueAdded Services through SMS.

UNIT III GPRS, 3G and 4G NETWORKS

10 HOURS

GPRS and Packet Data Network – GPRS Network Architecture – GPRS Network Operations – Data Services in GPRS- Applications for GPRS – Limitations of GPRS- Spread Spectrum Technology-CDMA Versus GSM—Features of 3G Networks– Architecture of 3G Applications of 3G - Features of 4G- Architecture of 4G - Wireless Technologies Used in 4G- Merits and Demerits of 4G- 5G Architecture-Features of 5G.

UNIT IV MOBILE AD-HOC NETWORKS

10 HOURS

MOBILE Ad-Hoc Basic Concepts – Characteristics – Applications – Design Issues – **Types of MANETS- Routing - Classification of Routing**–Essential of Traditional Routing Protocols – Popular Routing Protocols – Vehicular AdHoc Networks (VANET) – MANETVs VANET – Security of VANET and MANET.

UNIT V ANDROID OPERATING SYSTEM

8 HOURS

History of Android – Introduction to Android Operating Systems – Android Architecture - Android UI Layouts – Android UI Controls – Android Event Handling - Android Virtual Device Manager – Features of Eclipse and Android Studio – Comparison of Kotlin Language to Java – User Interface Architecture of Android: Application context, intents, Activity life cycle, User Interface, Design of Android – Features of Android SQLite Database – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone.

TOTAL: 48 HOURS

TEXT BOOKS:

1. Peter Spath, (2019). *“Learn Kotlin for Android Development”*, 3rd edition A Press Publications
2. Asoke K. Talukder, Hasan Ahmed, Roopa R Yavagal, (2017). *“Mobile Computing: technology, applications, and service creation”*, second Edition, Tata McGraw Hill, New Delhi.
3. Sunilkumar.S Manvi, Mahabaleshwar S.Kakkasageri,(2016). *“Wireless and Mobile Networks, Concepts and Protocols”*, Second Edition, Wiley Publications.

REFERENCE BOOKS:

1. Stefano Basagni, Marco Conti ,Silvia Giordano, Ivan Ivan Stojmenovic,(2015). *“Mobile Ad Hoc Networking, The Cutting-Edge Directions”*, first Edition, Wiley Publications.
2. James C. Sheusi, (2013). *“Android application development for Java programmers, Cengage Learning”*. Second Edition, Wesley Publications, New Delhi
3. Charles E. Perkins,(2008). *“AdHoc Networking”*, First Edition, Addison-Wesley Publications.

WEBSITES:

1. en.wikipedia.org/wiki/Mobile_computing
2. www.cse.iitk.ac.in/users/rkg/Talks/mobile_main.pdf
3. www.tutorialspoint.com/android/
4. pl.cs.jhu.edu/oose/resources/android/Android-Tutorial.pdf

NPTEL:

1. https://swayam.gov.in/nd1_noc19_ee48/preview

LMS:

1. <http://172.16.25.76/course/view.php?id=2224>

JOURNAL

1. Rohini Sharma," **A REVIEW PAPER ON MOBILE COMPUTING** ",Journal of University of Shanghai for Science and Technology, Volume 24, Issue 4, April - 2022 , ISSN: 1007-6735

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	2	-	-	-	3	-	-	-	2	-	-	-	-	-	-	2	-
CO2	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	3
CO3	-	-	2	-	-	-	-	-	2	-	-	-	-	-	-	-	-
CO4	2	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	3	1	3	-	1	-	-	-	1	-	-	-	-	-	-
Average	2	-	2.5	1	3	-	1	1	2	-	1	-	-	-	-	2	3

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

PREREQUISITE:

- A strong understanding of mathematical principles, such as linear algebra, number theory, and combinatorics.

COURSE OBJECTIVES (CO):

- To understand basics of Cryptography and Network Security.
- To understand theory of fundamental cryptography, encryption and decryption algorithms.
- To understand various Block Ciphers, DES and AES algorithms

COURSE OUTCOMES (COs):

Upon the completion of this course, the students will be able to

COs	Course Outcomes	Blooms Level
CO1	Analyze and design classical encryption techniques and block ciphers	Analyze
CO2	Organize various public key cryptographic techniques	Apply
CO3	Make use of symmetric and asymmetric key algorithms for cryptography	Apply
CO4	To develop secure authentication systems and evaluate the authentication and hash algorithms.	Apply
CO5	Compare any network from the threats in the world.	Analyze

UNIT I INTRODUCTION**10 HOURS**

Security Trends - The OSI Security Architecture – Security Attacks – Security Services – Security Mechanisms – A Model for Network Security. Classical Encryption Techniques – Symmetric Cipher Model – Substitution Techniques - Transposition Techniques – Rotor Machines - Steganography.

UNIT II BLOCK CIPHERS AND DATA ENCRYPTION STANDARDS**9 HOURS**

Block Cipher Principles – The Data Encryption Standard - The Strength of DES –Advanced Encryption Standard (AES) – Evaluation Criteria for AES – The AES Cipher – Multiple Encryption and Triple DES – Block Cipher Modes of Operation – Stream Ciphers and RC4-modular Arithmetic and Euclidean Algorithm.

UNIT III CONFIDENTIALITY USING SYMMETRIC ENCRYPTION**10 HOURS**

Principles of Public Key Cryptosystems, Placement of Encryption Function – Traffic Confidentiality – Public key Cryptography and RSA – The RSA Algorithm- Basic prime numbers and Discrete Logarithms– Diffie Hellman Key Exchange, - Key Management: Digital Signatures – Digital Signature Standard.

UNIT IV AUTHENTICATION AND HASH FUNCTIONS

9 HOURS

Authentication Functions, Message Authentication Codes (MAC's), User Authentication: Password, Certificate based & Biometric Authentication, Authentication Applications: Kerberos and X.509 . Hashes, MD5 & SHA – Security of Hash Functions and MAC's Digital Signatures and Authentication Protocols.

Unit V NETWORK SECURITY

10 HOURS

System Security: Intruders - Viruses and related threats, Need for Security, Network Security- Firewalls, IP Security, VPN, Intrusion Detection, E-mail security, Web Security: Secure socket layer and transport layer security, Blockchain Technology concepts.

TOTAL:48 HOURS

TEXT BOOKS:

1. Atul Kahate. (2019). *“Cryptography and Network Security”*. 4th Edition. Tata McGraw Hill. New Delhi.
2. Charlie Kaufman, Radia Perlman, & Mike Speciner. (2017). *“Network Security Private Communication in a Public World”*. 2nd Edition. Prentice-Hall of India. New Delhi.
3. William Stallings. (2017). *“Cryptography and Network Security Principles and Practices”*. 6th Edition. Pearson Education. New Delhi.
4. John F. Dooley. (2016). *“History of Cryptography and Cryptanalysis: Codes, Ciphers, and Their Algorithms”*. Springer.

REFERENCE BOOKS:

1. William Stallings (2020). *“Cryptography and Network Security Principles and Practice”*, Fourth Edition , Pearson Education.
2. Wenbo Mao (2019), *“Modern Cryptography: Theory and Practice”*, Fourth Edition, Prentice Hall PTR.
3. William Stallings (2021), *“Network Security Essentials: Applications and Standards”*, Fourth Edition Prentice Hall.
4. Douglas R. Stinson (2016). *“Cryptography: Theory and Practice”*, Second Edition, CRC press.

WEBSITES:

1. williamstallings.com/Crypto3e.html
2. u.cs.biu.ac.il/~herzbea/book.html (Link not active)
3. cryptofundamentals.com/algorithms
4. <https://www.tutorialspoint.com/cryptography/index.htm>
5. <https://nptel.ac.in/courses/106105162/>
6. Computer Systems Security | Electrical Engineering and Computer Science | MIT OpenCourseWare
7. <https://www.geeksforgeeks.org/blockchain-technology-introduction/>

JOURNALS

1. Yahia Alemami, Mohamad Afendee Mohamed, Saleh Atiewi, **Research on Various Cryptography Techniques**, International Journal of Recent Technology and Engineering (IJRTE), Volume-8, Issue-2S3, July 2019.

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	1	-	3	-	-	-	-	-	-	-	1	-	-	-	-	2	-
CO2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO3	-	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	2	-	-	-	-	-	-	-	-	-	-
CO5	-	-	3	-	3	-	2	-	-	-	-	-	2	-	-	-	-
Average	1	-	3	3	3	-	2	-	-	-	1	-	2	-	-	2	1

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

PREREQUISITE:

- Basic knowledge of Data Communication Networks.

COURSE OBJECTIVES (CO):

- To understand the basics of Adhoc & Sensor Networks
- To learn various fundamental and emerging protocols of all layers in adhoc network
- To study about the issues pertaining to major obstacles in establishment and efficient management of adhoc and sensor networks

COURSE OUTCOMES (COs):

Upon the completion of this course, the students will be able to

COs	Course Outcomes	Blooms Level
CO1	Utilize a Sensor network environment for different type of applications	Apply
CO2	Model the sensor network architectures using QoS and Congestion control mechanisms	Apply
CO3	Apply appropriate routing algorithms for different network environments	Apply
CO4	Analyze the working of ad-hoc and sensor network for various applications	Analyze
CO5	Classify security mechanisms in the wireless ad-hoc and sensor networks	Analyze

UNIT I ADHOC NETWORKS FUNDAMENTALS & COMMUNICATION PROTOCOLS**10 HOURS**

Fundamentals and Elements of WLANs – IEEE 802.11 Architecture – Self Configuration and Auto configuration – issues in Ad-Hoc Wireless Networks – MAC Protocols for Ad-Hoc Wireless Networks – Contention Based Protocols – TCP Over AdHoc Networks – TCP Protocol Overview TCP and MANETs – Solutions for TCP Over AdHoc Networks.

UNIT II ADHOC NETWORK ROUTING AND MANAGEMENT**10 HOURS**

Routing in Ad-Hoc Networks – Introduction – Topology based versus Position based Approaches Proactive Routing – DSDV, WRP, TBRPF Reactive Routing – DSR, AODV, Hybrid Routing Approach ZRP, CBRP- Location services – DREAM – Quorums based Location Service – Forwarding Strategies–Greedy Packet Forwarding, LAR.

UNIT III SENSOR NETWORK COMMUNICATION PROTOCOLS 10 HOURS

Introduction – Architecture – Single Node Architecture – Sensor Network Design Considerations
Energy Efficient Design Principles for WSN's – Protocols for WSN – Physical Layer – Transceiver
Design Considerations – MAC Protocols for wireless sensor network –IEEE 802.15.4 Zigbee
– Link Layer and Error Control Issues – Routing Protocols – Challenges for Wireless Sensor
Networks Gossiping and agent based unicast forwarding, Energy efficient unicast – Transport Protocols
& QoS – Congestion Control Issues – Application specific Support – Target detection and tracking.

UNIT IV SENSOR NETWORK MANAGEMENT AND PROGRAMMING 9 HOURS

Sensor Management – Topology Control Protocols and Sensing Mode Selection Protocols – Time
Synchronization – Localization and Positioning – Operating Systems and Sensor Network
Programming – Sensor Network Simulators - Case study: Industrial automation and tsunami early
warning system with wireless sensor networks.

UNIT V ADHOC AND SENSOR NETWORK SECURITY 9 HOURS

Security in Ad-Hoc and Sensor Networks – Key Distribution and Management – Software based
Anti – tamper Techniques – Water Marking techniques – Defence against Routing Attacks –
Secure Adhoc Routing Protocols – Broad cast Authentication WSN Protocols – TESLA – Biba –
Sensor Network Security Protocols – SPINS.

TOTAL: 48 HOURS

TEXT BOOKS:

1. Khan Shafiullah Et. Al, September (2021). *“Wireless Sensor Networks Current status and Future Trends”*, Second Edition, Taylor & Francis, ISBN: 9781138582712.
2. Rohtash Ghuriya, April (2015). *“Wireless AdHoc and Sensor Networks”*, Third Editin, Gazelle Book Services, ISBN: 9789380090733.
3. Carlos De Morais Cordeiro, Dharma Prakash Agrawal,(2011). *“Ad Hoc and Sensor Networks: Theory and Applications”*, Second Edition, World Scientific Publishing.
4. C.Siva Ram Murthy and B.S.Manoj, (2011). *“Ad Hoc Wireless Networks – Architectures and Protocols”*, Second Editin, Pearson Education,.

REFERENCE BOOKS:

1. TeiebZnati Kazem Sohraby, Daniel Minoli, (2010). *“Wireless Sensor Networks: Technology, Protocols and Applications”*, Third Edition, Wiley, ISBN: 13 978-8126527304
2. Walteneus Dargie, Christian Poellabauer, (2010). *“Fundamentals of Wireless Sensor Networks Theory and Practice”*, Third Edition, John Wiley and Sons,
3. Amiya Nayak,Ivan Stojmenovic,(2010). *“Wireless Sensor and Actuator Networks: Algorithm and Protocols for Scalable Coordination and Data communication”*, Third Edition, John Wiley & Sons.
4. Erdal Çayırçı, Chunming Rong, (2009). *“Security in Wireless AdHoc and Sensor Networks”*, Third Edition, John Wiley and Sons.
5. Subir Kumar Sarkar, T G Basavaraju, C Puttamadappa, (2008). *“Ad Hoc Mobile Wireless Networks”*, Second Editoin, Auerbach Publications.
6. C.K.Toth, (2007). *“AdHoc Mobile Wireless Networks”*, First Edition, Pearson Education.
7. Holger Karl, Andreas willing, (2007). *“Protocols and Architectures for Wireless Sensor*

WEBSITES:

1. www.winlab.rutgers.edu/~crose/dimacs03/kumar
2. https://link.springer.com/chapter/10.1007/978-3-642-37949-9_5
3. <https://www.slideshare.net/victorpaul/28-routing-in-mobile-adhoc-networks>
4. <https://onlinelibrary.wiley.com/doi/abs/10.1002/9780470516782>
5. <https://www.mooc-list.com/course/wireless-communication-emerging-technologies-coursera>

NPTEL:

1. <https://nptel.ac.in/courses/106105160/>

JOURNAL

1. Alexey Krasnopeev, Jin-Jun Xiao & Zhi-Quan Luo EURASIP Journal on “Wireless Communications and Networking” Volume 2005, Article number: 919686 (2005).

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	-
CO2	-	-	3	3	2	-	-	-	-	-	-	-	-	-	-	-	1
CO3	-	-	3	3	-	-	-	-	2	-	-	-	-	-	-	-	-
CO4	2	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Average	2	-	3	3	2	-	2	-	2	-	-	-	-	-	-	3	1

1 - Low, 2 - Medium, 3 - High, ‘-’; - No Correlation

PREREQUISITE:

- Familiarity with using a computer, navigating file systems, and using software applications.
- Basic arithmetic and logic are useful, especially for algorithmic thinking.

COURSE OBJECTIVES (CO):

- To master the principles of object-oriented programming and the interplay of algorithms and data structures in well-written modular code;
- To solve problems requiring the writing of well-documented programs in the Python language, including use of the logical constructs of that language;
- To understand the basic logic statements in Python.

COURSE OUTCOMES (COS):

Upon the completion of this course, the students will be able to

Cos	Course Outcomes	Blooms Level
CO1	Examine Python syntax and semantics and be fluent in the use of Python flow control and functions	Analyze
CO2	Make use of exception handling in Python applications for error handling.	Apply
CO3	To build and Infer the concepts of Object-Oriented Programming as used in Python.	Apply
CO4	Identify compound data using Python lists, tuples, dictionaries.	Apply
CO5	Examine Python Programs to Create, run and manipulate using core data structures like Lists, Dictionaries and use Regular Expressions.	Analyze

List of Programs

1. Write a program to demonstrate different number data types in python
2. Write a program to perform different arithmetic operations on numbers in python.
3. Write a program to create, concatenate and print a string and accessing substring from a given string.
4. Write a python program to create, append and remove lists in python.
5. Write a program to demonstrate working with tuples in python
6. Write a python program to define a module and import a specific function in that module to another program.
7. Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.
8. Write a python program using Graphical User Interfaces
9. Write a python program using Exceptional Handling
10. Write a python program using Chat Applications

TOTAL:48 HOURS

TEXT BOOKS:

1. Kenneth A. Lambert, Martin Osborne,(2018), “*Fundamentals of Python: First Programs, Cengage Learning*”, second edition, ISBN13:978-1337560092.
2. Paul Barry,(2016), “*Head First Python 2e*”, O’Reilly, 2nd Revised edition, ISBN-13: 978- 1491919538.
3. Michal Jaworski, TarekZiade,(2016), “*Expert Python Programming*”, Second Revised edition ,Packt Publishing, , ISBN-13: 978-1785886850.

REFERENCE BOOKS:

1. Sam Washington, Dr. M. O. FaruqueSarker, (2015) “*Learning Python Network Programming*”, Second Edition, Packt Publishing Limited, ISBN-13:978-1784396008.
2. Rick van Hattem,(2016), “*Mastering Python*”, Second Edition, Packt Publishing, ISBN 139781786463746.

WEBSITES:

1. www.python.org/about/gettingstarted/
2. www.tutorialspoint.com/python/index.htm
3. www.realpython.com/python-beginner-tips/
4. <https://nptel.ac.in/courses/106/106/106106182/>
5. <https://nptel.ac.in/courses/106106145>

JOURNAL

1. K. R. Srinath , “**Python – The Fastest Growing Programming Language**”, International Research Journal of Engineering and Technology (IRJET) ,Volume: 04 Issue: 12 , Dec-2017

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	-	-	-	-	-	-	-	2	-	-	-	-	2	-
CO2	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	3
CO3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	3	2	-	-	-	-	2	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	3	-	3	2	-	-	-	2	2	-	2	-	-	-	-	2	3

1 - Low, 2 - Medium, 3 - High, ‘-’; - No Correlation

PREREQUISITE:

- A solid understanding of mathematics is essential for data mining. This includes knowledge of algebra, calculus, probability, and statistics. Mathematical concepts such as linear algebra and optimization are also important for understanding algorithms used in data mining.
- Proficiency in programming is crucial for working with data and implementing data mining algorithms. Common programming languages used in data mining include Python, R, and SQL. You should be comfortable writing code, manipulating data, and using libraries and tools for data analysis.

COURSE OBJECTIVES(CO):

- To understand the concepts of data mining, KDD process, issues and applications.
- To know the working of different data mining techniques and its uses.
- To learn the usage of data mining tools WEKA and R.

COURSE OUTCOMES (COs):

Upon the completion of this course, the students will be able to

COs	Course Outcomes	Blooms Level
CO1	Analyze data mining problems and reason about the most appropriate methods to apply to a given dataset and knowledge extraction need.	Analyze
CO2	Analyze the working of different clustering algorithms.	Analyze
CO3	Apply the basic concepts of Association Rule Mining and evaluate the working of various Association Rule Mining algorithms	Apply
CO4	To apply different data mining algorithms to solve real world applications	Analyze
CO5	Analyze the working of WEKA and R Tools	Analyze

List of Programs**I. WEKA TOOL**

1. Installation of WEKA Tool
2. Creating new ARFF File
3. Preprocessing
4. Classification – Simple CART, Decision Tree, J48, Random Forest, ID3
5. Clustering – K-means, Hierarchical, DBSCAN
6. Association Rule Mining – Apriori, FP-Growth

II. R TOOL

1. Installation of R and packages in R
2. Basic Programs – Data Types, Built-in Functions, Operators, Conditional Statements, Looping Statements, Vectors, Matrix, Factors, Data Frames, Lists
3. Classification – Decision Tree, Random Forest, Naïve Bayes
4. Clustering – K-Means, K-Medoids, CLARA, Hierarchical
5. Association Rule Mining – Apriori

TOTAL: 48 HOURS

TEXTBOOKS:

1. Arun K. Pujari,(2009), “ *Data Mining Techniques*, Third Edition, Universities Press (India) Limited. Hyderabad.
2. Margaret H. Dunham,(2004), “ *Data Mining Introductory and Advanced Topics*, Second Edition, Pearson Education.
3. Ian H. Witten, Eibe Frank, Mark A. Hall, (2011), “*Data Mining: Practical Machine Learning Tools and Techniques*”. Elsevier.
4. Norman Matloff, (2011), “*The Art of R Programming a Tour of Statistical Software Design*” Third Edition, William Pollock.

REFERENCE BOOKS:

1. Emmanuel Paradis, (2005), “*R for Beginners*”,First Editon, Institutes Sciences Evolution.
2. Pieter Adriaans, DolfZantinge,(2008), “ *Data Mining*”, First Edition, Addison Wesley.
3. Jaiwei Han and MichelineKamber,(2011), “*Data Mining Concepts and Techniques*”, 3rd Edition. Morgan Kaufmann Publishers,
4. Dr. Matthew A. North,(2012), “*Data Mining for the Masses, A Global Text Project Book*,” Addison Wesley.
5. Roger D. Peng, (2015), “*R Programming for Data Science*”, 3rd Edition. Lean Publishing.

WEBSITES:

1. [h.https://swayam.gov.in/nd2_cec20_cs12/preview](https://swayam.gov.in/nd2_cec20_cs12/preview)
2. https://onlinecourses.nptel.ac.in/noc19_ma33/preview
3. <https://www.futurelearn.com/courses/data-mining-with-weka>
4. https://onlinecourses.nptel.ac.in/noc21_cs06/preview
5. <https://www.coursera.org/specializations/data-mining>
6. <https://www.mygreatlearning.com/academy/learn-for-free/courses/data-mining>

JOURNAL:

- 1 .Dr.Malla Reddy Jogannagari, Mrs. Maheshwari Manchala, “**Data Mining: Techniques, Tools and its Challenges**”, International Journal of Creative Research Thoughts (IJCRT) www.ijcrt.org, © 2020 IJCRT | Volume 8, Issue 7 July 2020 | ISSN: 2320-2882.

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	-	-	-	-	-	-	-	2	-	-	-	-	2	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
CO3	-	-	3	2	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-	1	-	-	-	-
CO5	-	-	3	-	3	-	-	-	-	-	2	-	-	-	-	-	-
Average	3	-	3	2.5	3	-	-	-	-	-	2	-	1	-	-	2	2

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

PREREQUISITE:

- Basic knowledge of HTML, CSS, & JavaScript
- Basic understanding of Databases, Frontend development, Text editor and execution of programs, etc.

COURSE OBJECTIVES (CO):

- To Construct a basic website using HTML and Cascading Style Sheets
- To learn the fundamentals of document databases technologies and to understand the significance of using MongoDB as a database system
- To understand the design issues in the development of backend components using Node.js and Express

COURSE OUTCOMES (COs):

Upon the completion of this course, the students will be able to

COs	Course Outcomes	Blooms Level
CO1	Classify the concepts of client side programming using CSS and Java Script	Analyze
CO2	Classify the concepts of Angular JS to extend basic HTML features	Analyze
CO3	Construct and build dynamic server side applications	Analyze
CO4	Build Responsive Web application using Angular Typescript	Apply
CO5	Use Mongo DB queries, tools and apply CRUD operations.	Apply

UNIT I REFRESHING JAVA SCRIPT AND CSS**10 HOURS**

CSS syntax, benefits, Responsive design, Bootstrap introduction, Java script syntax, Java script inbuilt objects, Error handling and event handling, DOM, Asynchronous Programming.

UNIT II INTRODUCTION TO ANGULAR JS**10 HOURS**

Basics and Syntax of Angular JS, Features, Advantages, Application Structure, Basics of routes and navigation, MVC with Angular JS, Services. Modules, Directives, Routes, Angular JS Forms and Validations, Data binding, creating single page website using Angular JS

UNIT III INTRODUCTION TO NODE JS**10 HOURS**

Setup Node JS Environment, Package Manager, Features, Console Object, Concept of Callbacks Events and Event Loop, timers, Error Handling, Buffers, Streams, Work with File System, Networking with Node (TCP, UDP and HTTP clients and servers), Web Module, Debugging, Node JS REST API, Sessions and Cookies, Design patterns, caching, scalability.

UNIT IV INTRODUCTION TO NoSQL

10 HOURS

Introduction to NoSQL Database, Architecture, Characteristics and Significance – NoSQL Database Classification – Key values Stores -Column Family Stores-Document Store – XML Database, Graph Database.

UNIT V DATABASE PROGRAMMING WITH NODE JS and MONGODB

8 HOURS

Basics of MongoDB, Data types, Connect Node JS with MongoDB, Operations on data (Insert, Find, Query, Sort, Delete, Update) using Node JS. Writing to MongoDB - CRUD operations - projections - Indexing - Aggregation - Replication - Sharding -Creating backup – Deployment

TOTAL: 48 HOURS

TEXT BOOKS:

1. Ruebbelke ,A(2013), “*Angularjs in Action*”, ISBN 9789351198383, 3rd Edition. Wiley Publication.
2. Alex Young, Bradley Meck, Mike Cantelon, Tim Oxley, Marc Harter, T.J. Holowaychuk, Nathan Rajlich (2018), “*Node.js in Action*”, ISBN 9789386052049, Second Editon,Wiley Publication.
3. Alex Young, Marc Harter, Ben Noordhuis (2017), “*Node.Js in Practice*”, ISBN 9789351197744 3rd Edition. Wiley Publication.
4. Jeffrey C and Jackson,(2011), “*Web Technologies A Computer Science Perspective*”, 3rd Edition. Pearson Education., New Delhi

REFERENCE BOOKS:

1. Shyam Seshadri (2019), “*Angular: Up and Running: Learning Angular, Step by Step*”, 1st edition, O’Reilly Publisher.
2. Pro MERN (2015), “*Stack, Full Stack Web App Development with Mongo, Express, React, and Node*, First Edition, Pearson Education.
3. Vasan Subramanian,(2019), “ *Web Technologies*”, first edition, A Press Publisher.

WEBSITES:

1. [.https://www.tutorialspoint.com/mongodb/mongodb_tutorial.pdf](https://www.tutorialspoint.com/mongodb/mongodb_tutorial.pdf)
2. hadoop.apache.org/
3. <https://neo4j.com/>
4. <https://nptel.ac.in/courses/106104189/>
5. www.mongodb.com

JOURNAL

1. S. Sachar, Kamini, & L. Suneja, “ **Review Paper on Mean Stack for Web Development**”. International Journal for Scientific Research & Development, vol. 5, no.1, pp.497-498, April 2017.

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	1	-	-	-	3	-	-	-	-	-	2	-	-	-	-	2	-
CO2	-	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	2
CO3	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CO4	-	-	-	3	-	-	2	1	1	-	-	-	-	-	-	-	-
CO5	-	-	3	-	-	-	2	-	-	-	-	-	-	-	-	-	-
Average	1	-	3	3	3	-	2	1	1	-	2	-	-	-	-	2	2

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

PREREQUISITE:

- Basics of Cyber Security.

COURSE OBJECTIVES (CO):

- To state the basic concepts in information security, including security policies, security models, and security mechanisms.
- To provide an exposure to the spectrum of security activities methods methodologies and procedures with emphasis on practical aspects of Information Security.
- To understand key terms and concepts in cyber law, intellectual property and cybercrimes, trademarks and domain theft.

COURSE OUTCOMES (COs):

Upon the completion of this course, the students will be able to

COs	Course Outcomes	Blooms Level
CO1	Analyze the basic principles and best practices of responding to a cybersecurity incident	Analyzing
CO2	Identify risk management processes, risk treatment methods, organization of information security.	Applying
CO3	Examine software vulnerabilities and security solutions to reduce the risk of exploitation.	Analyzing
CO4	To plan, develop, and implement a cybersecurity risk management program for organizations.	Applying
CO5	Be able to use cyber security, information assurance, and cyber/computer forensics software/tools.	Applying

UNIT I INTRODUCTION TO CYBER SECURITY AND SDG9**10 HOURS**

Cyber Security Fundamentals : Basic principles of cyber security - Importance of cyber security in sustainable infrastructure. Threats and Vulnerabilities in Modern Infrastructure :Common cyber threats to traffic, transport, and financial system- Vulnerabilities in smart transportation and stock market systems. Cyber Security Strategies for Sustainable Systems- Protecting critical infrastructure- Secure data management and privacy considerations. Regulatory and Compliance Requirements :Cyber security regulations for sustainable development-Ensuring compliance with international standards-Advanced Technologies in Cyber Security-Role of AI, machine learning, and blockchain in enhancing cyber security- Emerging technologies and their implications for sustainable infrastructure.

UNIT II CYBER OFFENSES**10 HOURS**

How Criminals Plan Them: Introduction: categories of Cybercrime -How criminals Plan the Attacks: Reconnaissance Passive Attacks Active Attacks Scanning and Scrutinizing Gathered Information Attack(Gaining and Maintaining the system Access) -social Engineering: Classification of Social Engineering – Cyber talking: Types of stalkers Cases Reported on Cyber stalking How stalking Works? real-life incident of Cyber stalking -Cybercafe and Cybercrimes - Botnets: The Fuel for cybercrime: Botnet - Attack Vector-Cloud Computing: Why cloud computing? Types of Services Cybercrime and Cloud Computing.

UNIT III CYBERCRIME**10 HOURS**

Mobile and wireless Devices-Introduction - Proliferation of Mobile and Wireless Devices - Trends in Mobility-Credit Card Frauds in Mobile and Wireless Computing Era: Types and Techniques of Credit Card Frauds - Security challenges Posed by Mobile Devices - Registry Settings for Mobile Devices - Authentication Service security: cryptographic security LDAP Security RAS Security Media Player Control Security Networking API Security - Attacks on Mobile/Cell Phones: Mobile Phone Theft Mobile Viruses Mishing Vishing Smishing Hacking Bluetooth.

UNIT IV MOBILE DEVICES**10 HOURS**

Security Implication for Organizations – Managing Diversity and Proliferation of Hand-Held Devices Unconventional/ Stealth Storage Devices Threats through Lost and Stolen Devices Protecting Data on lost devices Educating the Laptop Users - Organizational Measures for Handling Mobile devices - Related Security Issues: Encrypting Organization Databases Including Mobile Devices in Security Strategy -Organizational Security Policies and Measures in mobile Computing Era: Importance of Security polices relating to mobile Computing Devices Operating Guidelines for Implementing Mobile Devices Security Polices Organizational Policies for the Use of Mobile Hand - Held Devices - Laptops: Physical Security Countermeasures.

UNIT V TOOLS AND METHODS USED IN CYBERCRIME**8 HOURS**

Introduction - Proxy Servers and Anonymizers - Phishing: How Phishing Works? - Password Cracking: Online Attacks Offline Attacks Strong Weak and Random Passwords Random passwords - Keyloggers and Spywares: Software Keyloggers Hardware Keyloggers Anti Keylogger Spywares - Virus and Worms: Types of Virus - Trojan Horses and Backdoors: backdoor How to protect from Trojan Horses and Backdoors - Steganography: Steganalysis - DoS and DDoS Attacks: DoS Attacks Classification of DoS Attacks Types or Levels of DoS Attacks Tools Used to Launch DoS Attacks DDoS Attacks How to Protect from DoS/DDoS Attacks – SQL Injection: Steps for SQL Injection Attacks How to Prevent SQL Injection Attacks - Buffer Overflow: Types of Buffer Overflow How to Minimize Buffer Overflow - Attacks on Wireless Networks: Traditional Techniques of Attacks on Wireless Networks Theft of Internet Hours and Wi-fi-based Frauds and Misuses How to Secure the Wireless Networks.

TOTAL: 48 HOURS**TEXT BOOKS:**

1. Nina Godbole & SUNIT Belapure. (2013). “*CYBER SECURITY*”. Fourth Edition,Wiley India Pvt. Ltd. New Delhi .

2. Godbole, N. (2009). *“Information Systems Security: Metrics Frameworks and Best Practices”*. Second Edition, Wiley India. New Delhi.
3. Marther, T., Kumaraswamy, S., & Latif, S. (2009). *“Cloud Security and Privacy: An Enterprise Perceptive on Risk and Complainece”*. Second Edition, O’Reilly Publisher.

REFERENCE BOOKS:

1. Dieter Gollmann. (2006). *“Computer Security”*. 2nd edition. John Wiley & Sons.
2. Charles P. Pfleeger ,& Shari, L. Pfleeger. (2003). *“Cloud Security”*, Second Edition, McGraw Hill Publishing House.

WEBSITES :

1. <http://www.csc.ncsu.edu/faculty/ning>
2. csrc.nist.gov/publications/nistpubs/800-12/handbook.pdf
3. www2.warwick.ac.uk/fac/sci/dcs/teaching/modules/cs134/
4. <http://nptel.ac.in/courses/106105031/40> 5.
5. <http://nptel.ac.in/courses/106105031/39>
6. <http://nptel.ac.in/courses/106105031/38>

JOURNALS

1. Noura Al-Suwaidi , Haitham Nobanee , & Fauzia Jabeen, **Estimating Causes of Cyber Crime: Evidence from Panel Data FGLS Estimator**, International Journal of Cyber Criminology Vol 12 Issue 2 July – December 2018.

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	2	-	3	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	-	-		2	-	-	-	-	-	-	-	-	-	-	-	-	3
CO3	2	-	3		3	2	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-		2		2	-	1	-	-	-	-	-	-	-	-	-
CO5	2	-	3	-	3	-	-	-	-	-	-	-	-	-	1	-	-
Average	2	-	3	2	3	2	-	1	-	-	-	-	-	-	1	2	3

1 - Low, 2 - Medium, 3 - High, ‘-’; - No Correlation

PREREQUISITE:

- Skills in programming languages such as Python or R is a must for data science.

COURSE OBJECTIVES (CO):

- To understand the techniques and processes of data science
- To apply descriptive data analytics
- To visualize data for various applications

COURSE OUTCOMES (COs):

Upon the completion of this course, the students will be able to

COs	Course Outcomes	Blooms Level
CO1	Identify and appropriately acknowledge sources of data.	Apply
CO2	Apply Dimensionality regression techniques.	Apply
CO3	Solve the problems using various appliance learning techniques	Analyze
CO4	Be able to apply basic data cleaning techniques to prepare data for analysis.	Apply
CO5	Apply appropriate descriptive and inferential methods to summarize data and identify associations and relationships.	Apply

UNIT I INTRODUCTION TO DATA SCIENCE**10 HOURS**

Need for data science – benefits and uses – facets of data – data science process – setting the research goal – retrieving data – cleansing, integrating, and transforming data – exploratory data analysis – build the models – presenting and building applications.

UNIT II DESCRIPTIVE ANALYTICS**10 HOURS**

Frequency distributions – Outliers – interpreting distributions – graphs – averages – describing variability – interquartile range – variability for qualitative and ranked data - Normal distributions – z scores – correlation – scatter plots – regression – regression line – least squares regression line – standard error of estimate – interpretation of r^2 – multiple regression equations – regression toward the mean.

UNIT III INFERENTIAL STATISTICS**10 HOURS**

Populations – samples – random sampling – Sampling distribution- standard error of the mean - Hypothesis testing – z-test – z-test procedure – decision rule – calculations – decisions – interpretations - one-tailed and two-tailed tests – Estimation – point estimate – confidence interval – level of confidence – effect of sample size.

UNIT IV ANALYSIS OF VARIANCE**10 HOURS**

t-test for one sample – sampling distribution of t – t-test procedure – t-test for two independent samples – p-value – statistical significance – t-test for two related samples. F-test – ANOVA – Two-factor experiments – three f-tests – two-factor ANOVA – Introduction to chi-square tests.

UNIT V PREDICTIVE ANALYTICS**8 HOURS**

Linear least squares – implementation – goodness of fit – testing a linear model – weighted resampling. Regression using Stats Models – multiple regression – nonlinear relationships – logistic regression – estimating parameters – Time series analysis – moving averages – missing values – serial correlation – autocorrelation. Introduction to survival analysis.

TOTAL: 48 HOURS**TEXT BOOKS:**

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali,(2016), “*Introducing Data Science*”, Third Edition,Manning Publications.
2. Robert S. Witte and John S. Witte, (2017), “*Statistics*”, Eleventh Edition, Wiley Publications.
3. Jake VanderPlas, (2016), “*Python Data Science Handbook*”, Fifth Edition, O’Reilly.
4. Allen B. Downey, (2014), “*Think Stats: Exploratory Data Analysis in Python*”, Green Tea Press.

REFERENCE BOOKS:

1. Sanjeev J. Wagh, Manisha S. Bhende, Anuradha D. Thakare, (2022), “*Fundamentals of Data Science*”, Fifth Edition, CRC Press.
2. Chirag Shah L.(2020), “*A Hands-On Introduction to Data Science*”, sixth edition, Cambridge University Press.
3. Vineet Raina, Srinath Krishnamurthy, (2021), “*Building an Effective Data Science Practice: A Framework to Bootstrap and Manage a Successful Data Science Practice*”, seventh edition, Apress.

WEBSITES:

1. <https://www.amazon.in/Data-Analytics-Made-Accessible-2018-ebook/dp/B00K2I2JL8> .
2. <https://www.amazon.in/Data-Analytics-Made-Accessible-2018-ebook/dp/B00K2I2JL8>
3. <http://www.bigdatauniversity.com>
4. <https://builtin.com/data-science>
5. <https://www.udacity.com/course/intro-to-data-science--ud359>

JOURNAL

1. Sneha Satish Dingre, “AN APPROACH TO PERSONALIZED MARKETING USING GENERATIVE AI” Article Id : IJDSA_01_01_001, Pages : 1-8, INTERNATIONAL JOURNAL OF DATA SCIENCE AND ANALYTICS (IJDSA) , Volume 1, Issue 1, January-December 2023

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	2	-	-	-	3	-	-	-	-	-	1	-	-	-	-	2	-
CO2	-	-	3	2	-	1	-	-	-	-	-	-	-	-	-	-	3
CO3	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
CO4	2	-	3	2	3	-	-	2	-	-	-	-	-	-	-	-	-
CO5	-	-	3	-	3	-	-	2	-	-	-	-	-	-	-	-	-
Average	2	-	3	2	3	1	1	2	-	-	1	-	-	-	-	2	3

1 - Low, 2 - Medium, 3 - High, ‘-’; - No Correlation

PREREQUISITE:

- Understanding networking concepts such as IP addresses, protocols (like TCP/IP, MQTT, HTTP), and communication technologies (like Wi-Fi, Bluetooth, Zigbee) is essential for connecting IoT devices to the internet and to each other.
- Understanding basic cybersecurity concepts and best practices for securing IoT devices and networks is crucial.

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 the completion of this course, the students will be able to

COs	Course Outcomes	Blooms Level
CO1	Take part in the impact and challenges posed by IoT networks leading to new architectural models.	Analyze
CO2	Compare different Application protocols for IoT.	Analyze
CO3	Inspect privacy, security and design related challenges of IoT	Analyze
CO4	Explain the smart objects and the technologies to connect them to network	Evaluate
CO5	To build basic IoT applications on embedded platform.	Apply

UNIT I INTRODUCTION**10 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 – DNA of 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**10 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 protocols - cellular Internet access protocol - Machine-to-machine protocol - Modbus – KNX – Zigbee Architecture.

UNIT III WEB OF THINGS

10 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 -Connectivity Technologies. Cloud of Things: Grid/SOA and Cloud Computing – Cloud Middleware – Cloud Standards – The Cloud of Things Architecture.

UNIT IV INTEGRATING IoT

10 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

8 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 - Case studies: Sensor body-area-network and Control of a smart home.

TOTAL: 48 HOURS

TEXT BOOKS:

1. HonboZhou . (2018). “*The Internet of Things in the Cloud:A Middleware Perspective*”—Thrid Edition, CRC Press .
2. Olivier Hersent, Omar Elloumi and David Boswarthick . (2017). “*The Internet of Things: Applications to the Smart Grid and Building Automation*” . Fourth Editin, Wiley Publications.
3. Olivier Hersent, David Boswarthick, Omar Elloumi. (2017). “*The Internet of Things – Key applications and Protocols*”.Third Editin, Wiley Publications.

REFERENCE BOOKS:

1. Dieter Uckelmann; Mark Harrison; Florian Michahelles- (Eds.).(2016). “*Architecting the Internet of Things*”— Springer.
2. David Easley and Jon Kleinberg . (2016). “*Networks, Crowds, and Markets: Reasoning About a Highly Connected World*”, Second Edition, Cambridge University Press.

WEBSITES:

1. <https://www.ibm.com/blogs/internet-of-things/what-is-the-iot>
2. <https://www.i-scoop.eu/internet-of-things-guide>
3. <https://iot-analytics.com>
4. <https://nptel.ac.in/courses/106105166/>

JOURNALS:

1. Mardianabinti , Mohamad NoorWan, HaslinaHassan,” **Current research on Internet of Things (IoT) security: A survey**”, Computer Networks,Volume 148, 15 January 2019, Pages 283-294

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	-	-	-	-	-	2	-	-	-	-	3	-
CO2	-	-	2	1	3	-	-	-	-	-	-	-	-	-	-	-	2
CO3	3	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CO5	-	-	2	-	3	2	-	-	-	-	-	-	-	-	-	-	-
Average	3	-	2	1	3	2	-	-	-	-	2	-	-	-	-	3	2

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

PREREQUISITE:**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 (Department Activity)**5 HOURS**

Awareness and Safe Use of Mobile Phones and Apps : Installing and Using Apps- App Permissions-Updating Apps - Recognizing Scams- Password Management- Safe Browsing.

UNIT V (Department Activity)**4 HOURS**

Online Services for Daily Needs: E-Governance - Digital Payments - Health Information

TOTAL : 24 HOURS**TEXT BOOK:***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

COs	PO1	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

PREREQUISITE:

- Basic knowledge of a programming language (like Python or R) is helpful for data analysis and automation.

COURSE OBJECTIVES (CO):

- To find the association between attributes.
- To find the correlation between two variables and form regression lines.
- To understand the concepts of sampling

COURSE OUTCOMES (COs):

Upon the completion of this course, the students will be able to

COs	Course Outcomes	Blooms Level
CO1	Analyze the data pertaining to attributes and to interpret the results.	Analyze
CO2	To recognize and evaluate the relationship between two quantitative variables through simple linear correlation and regression	Evaluate
CO3	Determine the familiar concepts for binomial, Poisson, normal and log-normal probability distributions	Evaluate
CO4	Experiment with linear combinations of random variables and the Central Limit Theorem	Apply
CO5	Apply correctly a variety of statistical techniques, both descriptive and inferential	Apply

UNIT I INTRODUCTION**10 HOURS**

Analysis of categorical data: Definition of attributes. Independence, association and partial association of attributes, various measures of association (Yule's) for 2 –way data and coefficient of contingency (Pearson and Tcheprov's) and coefficient of colligation. Bivariate data, Scattered diagram, Principle of least squares, fitting of a straight line, quadratic, exponential and power curves.

UNIT II CORRELATION AND REGRESSION**10 HOURS**

Definition, Types of correlation, Methods of Studying Correlation Scattered diagram, Product moment correlation coefficient and its properties. Computation of correlation coefficient for grouped data, Spearman's Rank correlation coefficient and its properties, Correlation ratio. Partial and multiple correlation coefficients (only for three variables). Simple linear regression, lines of regression, properties of regression coefficients, Correlation verses Regression.

UNIT III DISTRIBUTIONS**10 HOURS**

Concepts of population, parameter, random sample, statistic, sampling distribution and standard error. Standard error of sample mean(s) and sample proportion(s). Exact sampling distributions- statement and properties of χ^2 , t and F distributions and their interrelationships. Independence of sample mean and variance in random sampling from normal distributions.

UNIT IV NORMAL AND EXPONENTIAL**10 HOURS**

Statement of Neyman's Factorization theorem, derivations of sufficient statistics in case of Binomial, Poisson, Normal and Exponential (one parameter only) distributions. Estimation by the method of moments, Maximum likelihood estimation (MLE)

UNIT V ESTIMATION OF INTERVALS**8 HOURS**

Statements of asymptotic properties of MLE. Concept of interval estimation. Confidence intervals of parameters of normal population by pivot method. Criteria of a good estimator- consistency, unbiasedness, efficiency and sufficiency with examples. Point estimation of a parameter, concept of bias and mean square error of an estimate.

TOTAL: 48 HOURS**TEXT BOOKS:**

1. Goon A.M., Gupta M.K. and Dasgupta B. (2012): "*Fundamentals of Statistics*", Vol. I & II, 8th Edn. The World Press, Kolkata.
2. Miller, Irwin and Miller, Marylees John E. (2016): "*Freund's Mathematical Statistics with Applications*", 7th Edn, Pearson Education, Asia.
3. V.K.Kapoor and S.C.Gupta(2010): "*Fundamentals of Mathematical Statistics*", Seventh Edition, Sultan Chand & Sons, New Delhi

REFERENCE BOOKS:

1. William Feller(2016) "*Introduction to Probability theory and its applications*". Volume- I, Fifth Edition, Asian Publishing House, Bombay.
2. Hoel P.G(2017), "*Introduction to mathematical Statistics*", Third Edition Revised, Asia Publishing house.

WEBSITES:

1. http://www.bu.edu/met/metropolitan_college_people/student/resources/conduct/code.html
2. <https://www.openintro.org/stat/>

JOURNAL

1. Cleveland, W.S., Robust, "Locally Weighted Regression And Smoothing Scatterplots", Journal Of The American Statistical Association 74: 829 (2015).

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	-	-	-	-	-	-	-	3	-	-	-	-	2	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
CO3	-	-	2	-	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	2	-	-	1	-	-	3	-	-	-	-	-	-
Average	3	-	2	-	2	-	-	1	-	-	3	-	-	-	-	2	2

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

PREREQUISITE:

- Familiarity with fundamental concepts like algorithms, data structures, and networking.

COURSE OBJECTIVES (CO):

- To understand the concepts of block chain technology
- To understand the consensus and hyper ledger fabric in block chain technology.
- To assess blockchain applications in a structured manner.

COURSE OUTCOMES (COs):

Upon the completion of this course, the students will be able to

COs	Course Outcomes	Blooms Level
CO1	Make use of basic concepts and technology used for blockchain.	Apply
CO2	Determine the various technologies and protocols that make block chain possible.	Evaluate
CO3	Analyze the block chain applications in a structure manner.	Analyze
CO4	Analyze the positive and negative implications of using blockchain technology in various industries.	Analyz
CO5	Apply security features in blockchain technologies.	Appying

UNIT I INTRODUCTION**10 HOURS**

History: Digital Money to Distributed Ledgers -Design Primitives: Protocols, Security, Consensus, Permissions, Privacy- : Block chain Architecture and Design-Basic crypto primitives: Hash, SignatureHash chain to Block chain-Basic consensus mechanisms.

UNIT II BLOCK CHAIN PROTOCOLS**10 HOURS**

Requirements for the consensus protocols-Proof of Work (PoW)-Scalability aspects of Block chain consensus protocols: Permissioned Block chains-Design goals-Consensus protocols for Permissioned Block chains.

UNIT III COMPONENTS OF CHAIN**10 HOURS**

Decomposing the consensus process-Hyper ledger fabric components-Chain code Design and Implementation: Hyper ledger Fabric II:-Beyond Chain code: fabric SDK and Front End-Hyper ledger composer tool.

UNIT IV BLOCK CHAIN IN FINANCIAL SOFTWARE AND SYSTEMS**10 HOURS**

Block chain in Financial Software and Systems (FSS): -Settlements, -KYC, -Capital markets-Insurance Block chain in trade/supply chain: Provenance of goods, visibility, trade/supply chain finance, invoice management/discounting.

UNIT V BLOCK CHAIN FOR GOVERNMENT**8 HOURS**

Block chain for Government: Digital identity, land records and other kinds of record keeping between government entities, public distribution system / social welfare systems: Block chain Cryptography: Privacy and Security on Block chain.

TOTAL: 48 HOURS**TEXT BOOKS:**

1. Mark Gates, (2017), "*Block chain: Ultimate guide to understanding block chain, bit coin, crypto currencies, smart contracts and the future of money*", Third Edition, Wise Fox Publishing and Mark Gates.
2. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman Ramakrishna, (2018), "*Hands-On Block chain with Hyper ledger: Building decentralized applications with Hyperledger Fabric and Composer*". Fourth Edition, Wise Fox Publishing and Mark Gates.
3. Bahga, Vijay Madiseti, (2017), "*Block chain Applications: A Hands-On Approach*", Second Edition, Arshdeep Bahga, Vijay Madiseti publishers.

REFERENCE BOOKS:

1. Andreas Antonopoulos, (2014), "*Mastering Bitcoin: Unlocking Digital Crypto Currencies*", Fourth Edition, O'Reilly Media, Inc.
2. Melanie Swa, (2014), "*Block Chain*", Third Edition, O'Reilly Media.

WEBSITES:

1. <https://nptel.ac.in/courses/106105184/>
2. www.tutorials.point

JOURNAL

1. Saha, Satarupa and Jana, Bappaditya and Poray, Jayanta, A Study on Blockchain Technology (October 15, 2019). Available at SSRN: <https://ssrn.com/abstract=3477373> or <http://dx.doi.org/10.2139/ssrn.3477373>

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	-
CO2	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Average	3	-	2	2	1	-	-	-	-	-	1	-	1	-	-	2	-

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

PREREQUISITE:

- Understanding of basic neural network architecture, including feedforward networks, activation functions, and backpropagation algorithm.

COURSE OBJECTIVES (CO):

- To understand the fundamentals of neural networks
- To learn about the working principles of back propagation networks
- To learn about introduction and different architectures of neural network

COURSE OUTCOMES (COs):

Upon the completion of this course, the students will be able to

COs	Course Outcomes	Blooms Level
CO1	Plan a single and multi-layer feed-forward deep networks and tune various hyper-parameters	Apply
CO2	Experiment with feed-forward and deep networks.	Apply
CO3	Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.	Apply
CO4	Scientifically evaluate and compare the performance and generalisation of deep learning models.	Analyze
CO5	Inspect deep learning algorithms and solve real-world problems.	Analyze

UNIT I INTRODUCTION TO NEURAL NETWORKS**10 HOURS**

Basic concept of Neurons – Perceptron Algorithm – Feed Forward and Back Propagation Networks.

UNIT II FEED FORWARD NEURAL NETWORKS**10 HOURS**

Feed Forward Neural Networks – Gradient Descent – Back Propagation Algorithm – Vanishing Gradient problem – Mitigation – ReLU Heuristics for Avoiding Bad Local Minima – Heuristics for Faster Training.

UNIT III CONVOLUTION NEURAL NETWORKS**10 HOURS**

Nesters Accelerated Gradient Descent – Regularization – Dropout. CNN Architectures – Convolution – Pooling Layers – Transfer Learning – Image Classification using Transfer Learning.

UNIT IV RECURRENT NEURAL NETWORKS**10 HOURS**

RNN, LSTM, GRU, Encoder/Decoder Architectures – Autoencoders – Standard- Sparse – Denoising – Contractive- Variational Autoencoders – Adversarial Generative Networks – Autoencoder and DBM- Image Segmentation – Object Detection – Automatic Image Captioning– Image generation with Generative Adversarial Networks – Video to Text with LSTM Models.

TEXT BOOKS:

1. Francois Chollet.(2018). *“Deep Learning with Python”*, First Edition, Manning Publications.
2. Ragav Venkatesan, Baoxin Li. (2018). *“Convolutional Neural Networks in Visual Computing”*, First Edition.,CRC Press
3. Navin Kumar Manaswi. (2018). *“Deep Learning with Applications Using Python”*, First Edition. A press,

REFERENCE BOOKS:

1. Phil Kim.(2017). *“Matlab Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence”*, First Edition. A Press, Third Edition.
2. Ian Good Fellow, Yoshua Bengio and Aaron Courville. (2017). *“Deep Learning”*, MIT Press, First Edition.
3. Joshua F. Wiley.(2016). *“Deep Learning Essentials”*, First Edition ,Packt Publications.

WEBSITES:

1. www.nptel.ac.in/courses/106/106/106106184/
2. www.nptel.ac.in/courses/106/106/106106201/
3. www.nptel.ac.in/courses/106/105/106105215/
4. www.ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-s191/introduction-to-deep-learning-january-iap-2020/
5. www.kaggle.com/learn/intro-to-deep-learning

JOURNALS

1. Simone A. Ludwig, **Applying a Neural Network Ensemble to Intrusion Detection** Journal of Artificial Intelligence and Soft Computing Research, Volume 9, Issue 3 (2019), pp. 177–188

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	-	-	-	-	3	-
CO2	-	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO3	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CO4	3	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Average	3	-	2.5	2	1	-	-	-	-	-	2	-	-	-	-	3	2

1 - Low, 2 - Medium, 3 - High, ‘-’; - No Correlation

PREREQUISITE:

- Basic knowledge of HTML, CSS, & JavaScript
- Basic understanding of Databases, Frontend development, Text editor and execution of programs, etc.

COURSE OBJECTIVES (CO):

- To construct a basic website using HTML and Cascading Style Sheets
- To learn the fundamentals of document databases technologies and to understand the significance of using MongoDB as a database system
- To understand the design issues in the development of backend components using Node.js and Express

COURSE OUTCOMES (COs):

Upon the completion of this course, the students will be able to

COs	Course Outcomes	Blooms Level
CO1	Classify the concepts of client side programming using CSS and Java Script	Analyze
CO2	Classify the concepts of Angular JS to extend basic HTML features	Analyze
CO3	Construct and build dynamic server side applications	Analyze
CO4	Build Responsive Web application using Angular Typescript	Apply
CO5	Use Mongo DB queries, tools and apply CRUD operations.	Apply

List of Programs

1. Create a web page with all types of Cascading style sheets
2. Develop Angular JS program that allows user to input their first name and last name and display their fullname. Note: The default values for first name and last name may be included in the program.
3. Write an Angular JS application that can calculate factorial and compute square based on given user input.
4. Develop Angular JS application that displays a detail of students and their CGPA. Allow users to read the number of students and display the count. Note: Student details may be included in the program.
5. Write an Angular JS program to create a simple CRUD application (Create, Read, Update, and Delete) for managing users.
6. Create an Angular JS application that displays a list of employees and their salaries. Allow users to search for employees by name and salary. Note: Employee details may be included in the program
7. Develop Angular JS program to create a login form, with validation for the username and password fields.
8. Create an Angular JS application that displays the date by using date filter parameters.

9. MongoDB update document

- Using update() method.
- Using save() method.

10. MongoDB delete document from a collection.

- Using remove() method.
- Remove only one document matching your criteria
- Remove all documents

11. Create a program using limit(), skip(), sort() methods in MongoDB.

TOTAL: 48 HOURS

TEXT BOOKS:

- Shakuntala Gupta Edward. (2018). *“Practical Mongo DB”*, 2nd edition, Apress Publications, ISBN 1484206487
- Rick Copeland. (2017). *“MongoDB Applied Design Patterns”*, 1st Edition, O’Reilly Media Inc.
- Mike Wilson.. (2017). *“Building Node Applications with MongoDB and Backbone”*, Second Edition, O’Reilly Media Inc.
- Kyle Banker. (2016). *“MongoDB in Action”*. Second Edition, Manning Publications Co.
- Gautam Rege, (2016). *“Ruby and MongoDB Web Development Beginner's Guide”*. Second Edition, Packt Publishing Ltd

REFERENCE BOOKS:

- David Hows. (2016). *“The definitive guide to MongoDB”*, 2nd edition, Apress Publication, 8132230485
- Agus Kurniawan, (2014), *“AngularJS Programming by Example”*, 1st Edition, PE Press,
- Andrew Grant, (2014), *“Beginning AngularJS”*, 1st Edition, Apress,.

WEBSITES:

- <https://www.w3schools.com/angular/>
- <https://nodejs.org/en>
- <http://www.mongodb.org/about/applications/>
- <http://www.mongodb.org/>
- <https://nptel.ac.in/courses/106106156/>

JOURNAL

- S.Sachar, Kamini, & L. Suneja, **“Review Paper on Mean Stack for Web Development”**. International Journal for Scientific Research & Development, vol. 5, no.1, pp.497-498, April 2017.

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	1	-	-	-	3	-	-	-	-	-	2	-	-	-	-	2	-
CO2	-	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	2
CO3	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CO4	-	-	-	3	-	-	2	1	1	-	-	-	-	-	-	-	-
CO5	-	-	3	-	-	-	2	-	-	-	-	-	-	-	-	-	-
Average	1	-	3	3	3	-	2	1	1	-	2	-	-	-	-	2	2

1 - Low, 2 - Medium, 3 - High, ‘-’; - No Correlation

PREREQUISITE:

- Skills in programming languages such as Python or R is a must for data science.

COURSE OBJECTIVES (CO):

- To understand the techniques and processes of data science
- To apply descriptive data analytics
- To visualize data for various applications

COURSE OUTCOMES (COs):

Upon the completion of this course, the students will be able to

COs	Course Outcomes	Blooms Level
CO1	Develop python programs to handle data using Numpy and Pandas	Apply
CO2	Make use of descriptive analytics concepts	Apply
CO3	Take part in data exploration using Matplotlib	Analyze
CO4	Determine inferential data analytics concepts	Evaluate
CO5	Build models of predictive analytics	Analyze

List of Programs

1. Write a program to show the working of Numpy arrays in Python.
2. Write a Python Program to work with Pandas data frames.
3. Develop python program for Basic plots using Matplotlib.
4. Write a python program to calculate and compute Frequency distributions, Averages, Variability
5. Write a python program to create and compute Normal curves, Correlation and scatter plots, Correlation coefficient
6. Write a python program for Simple Linear Regression
7. Write a program to perform Z-test
8. Write a program to perform T-test using sampling distribution
9. Write a program to perform ANOVA test.
10. Write a program to Build and validate linear models.
11. Write a program Building and validating logistic models.
12. Write a program to perform Time series analysis.

TOTAL: 48 HOURS

TEXT BOOKS:

1. Jake VanderPlas, (2016), “*Python Data Science Handbook*”, Fourth Edition, O’Reilly.
2. Allen B. Downey, (2014), “*Think Stats: Exploratory Data Analysis in Python*”, Third Edition, Green Tea Press.
3. Dr. Ossama Embarak (2011), “*Data Analysis and Visualization Using Python, Analyze Data to Create Visualizations for BI Systems*, Second Edition, O’Reilly

REFERENCE BOOKS:

1. Chirag Shah, (2020), “*A Hands-On Introduction to Data Science*”, Sixth Edition, Cambridge University Press.
2. Vineet Raina, Srinath Krishnamurthy, (2021), “*Building an Effective Data Science Practice: A Framework to Bootstrap and Manage a Successful Data Science Practice*”, Seventh Edition, Apress.

WEBSITES:

1. <https://www.amazon.in/Data-Analytics-Made-Accessible-2018-ebook/dp/B00K2I2JL8> .
2. <https://www.amazon.in/Data-Analytics-Made-Accessible-2018-ebook/dp/B00K2I2JL8>
3. <http://www.bigdatauniversity.com>
4. <https://builtin.com/data-science>
5. <https://www.udacity.com/course/intro-to-data-science--ud359>

JOURNAL

1. Sneha Satish Dingre, “AN APPROACH TO PERSONALIZED MARKETING USING GENERATIVE AI”
Article Id : IJDSA_01_01_001, Pages : 1-8, *INTERNATIONAL JOURNAL OF DATA SCIENCE AND ANALYTICS (IJDSA)*, Volume 1, Issue 1, January-December 2023

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	1	-	-	-	3	-	-	-	-	-	2	-	-	3	-
CO2	-	-	3	2	-	-	-	-	-	-	-	-	-	-	2
CO3	-	-	-	2	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	3	-	3	-	-	-	-	-	2	-	-	-	-
Average	1	-	3	2	3	3	-	-	-	-	2	-	-	3	2

1 - Low, 2 - Medium, 3 - High, ‘-’; - No Correlation

PREREQUISITE:

- Understanding Java basics, object-oriented programming, exception handling, and Java collections.
- Familiarity with Servlets and JavaServer Pages (JSP).

COURSE OBJECTIVES (CO):

- To Learn how to communicate with databases using Java.
- To Handle Errors and Exceptions in Web Applications
- To Use NetBeans IDE for creating J2EE Applications

COURSE OUTCOMES (COs):

Upon the completion of this course, the students will be able to

COs	Course Outcomes	Blooms Level
CO1	Able to Solve Problems using java collection framework and I/o classes.	Apply
CO2	Students get to access database through Java programs, using Java Database Connectivity (JDBC)	Apply
CO3	Construct elementary modifications to Java programs that solve real-world problems.	Apply
CO4	Make use of reusable software component, using Java Bean	Apply
CO5	Discover dynamic web pages, using Servlets and JSP	Analyze

UNIT I J2EE OVERVIEW**10 HOURS**

Beginning of Java – Java Byte code – Advantages of Java –J2EE and J2SE. J2EE Multi Tier Architecture – Distributive Systems – The Tier – Multi Tier Architecture – Client Tier Web Tier Enterprise Java Beans Tier Enterprise Information Systems Tier Implementation.

UNIT II J2EE DATABASE CONCEPTS**10 HOURS**

Data – Database – Database Schema. Introduction- Jdbc Architecture- Types of Drivers. Statement- ResultSet- Read Only ResultSet -Updatable ResultSet--Forward Only ResultSet - Scrollable ResultSet – Prepared Statement—Metadata- Connection Modes-SavePoint- Batch Updates-Callable Statement- BLOB & CLOB.

UNIT III JAVA SERVLETS**10 HOURS**

Benefits – Anatomy – HTML Forms- HTTP: Request-response, headers, GET, POST -Servlet Lifecycle: init(), service(), destroy()- Requests and responses- Core Servlet API: Generic Servlet, Servlet Request, and Servlet Response-HTTP Servlets: Http Servlet Request, Http Servlet Response and Http Servlet- Accessing Parameters

UNIT IV ENTERPRISE JAVA BEANS**10 HOURS**

Entity Java Bean - Session Java Bean – Home and Remote Interfaces-Stateless bean- Stateful bean- EJB Exceptions- EJB deployment process Message Driven Bean.

UNIT V JSP**8 HOURS**

Java Server Pages – The life cycle of a JSP – using objects within JSP pages – Literals and Operators - Custom Tags in JSP pages – JSP scripting elements and directives - Reserved words- Java Remote Method Invocation.

TOTAL:48 HOURS**TEXT BOOKS:**

1. Jim Keogh. (2018). *“The Complete Reference J2EE”*, 1st edition, Tata McGraw Hill New Delhi:.
2. Duane, K. Fields., & Mark, A. Kolb. (2017). *“Web Development with Java Server Pages”* 1st ed.. Pune: Manning Publications.
3. Rod Johnson. (2017). *“J2EE Development without EJB”*, 1st edition. New Delhi:Wiley Dream Tech.

REFERENCE BOOKS:

1. Rod Johnson., & Rod Johnson, P.H. (2016). *“Expert One-On-One J2EE Design and Development”*.first edition, John Wiley & Sons. New Delhi:
2. Paul, J. Perrone., Venkata, S. R. Chaganti., Venkata S. R. Krishna., & Tom Schwenk. (2016). *“J2EE Developer's Handbook”*. First Edition, Sams Publications. New Delhi
3. Joseph, J. Bambara et al. (2016). *“J2EE Unleashed”* 1st edition, Tech Media. New Delhi

WEBSITES:

1. <https://www.oracle.com/technetwork/java/javaee/appmodel-135059.html>
2. <https://www.geeksforgeeks.org/introduction-java-servlets/>
3. <http://media.datadirect.com/download/docs/jdbc/alljdbc/jdbcconnect/j2ee.html>
4. <https://www.javatpoint.com/ejb-tutorial>
5. <https://www.javatpoint.com/jsp-tutorial>
6. <https://nptel.ac.in/courses/106105191/>

JOURNAL

1. Aeiman Gadafi, Daniel Hagimont ,Laurent Broto ,Remi Sharrock ,Alain Tchana and Noel De Palma
Published Online: February 6, 2014pp 54-72 <https://doi.org/10.1504/IJAC.2014.059112>

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	2	-	3	-	-	-	-	-	-	-	2	-	-	-	-	3	-
CO2	-	-	3	-	-	-	-	-	3	-	-	-	2	-	-	-	2
CO3	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	2	-	3	-	-	-	-	-	2	-	-
Average	2	-	3	-	1	-	2	-	2	-	2	-	2	-	2	3	2

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

PREREQUISITE:

- Understanding the phases of SDLC (Requirements gathering, Design, Development, Testing, Deployment, Maintenance).
- Understanding of test planning, test case design, test execution, defect reporting, and tracking.

COURSE OBJECTIVES (CO):

- To understand the basics of testing, test planning & design and test team organization
- To study the various types of tests in the life cycle of the software product.
- To learn the techniques for quality assurance and applying for applications.

COURSE OUTCOMES (COs):

Upon the completion of this course, the students will be able to

COs	Course Outcomes	Blooms Level
CO1	Determine the quality assurance process and its role in software development.	Evaluate
CO2	Determine variety of testing techniques, methods, and tools	Evaluate
CO3	Plan the test cases for different applications.	Apply
CO4	Identify defect prevention techniques and software quality assurance metrics.	Apply
CO5	Apply systematic procedure for software design and deployment.	Apply

UNIT I SOFTWARE TESTING - CONCEPTS, ISSUES, AND TECHNIQUES**10 HOURS**

Quality Revolution, Verification and Validation, Failure, Error, Fault, and Defect, Objectives of Testing, Testing Activities, Test Case Selection White-Box and Black, test Planning and design, Test Tools and Automation, Power of Test. Test Team Organization and Management-Test Groups, Software Quality Assurance Group, System Test Team Hierarchy, Team Building.

UNIT II SYSTEM TESTING**10 HOURS**

System Testing - System Integration Techniques-Incremental, Top-DownBottom-Up Sandwich and Big Bang, Software and Hardware Integration, Hardware Design Verification Tests, Hardware and Software Compatibility Matrix Test Plan for System Integration. Built- in Testing. functional testing - Testing a Function in Context. Boundary Value Analysis, Decision Tables. Acceptance testing - Selection of Acceptance Criteria, Acceptance Test Plan, Test Execution Test. software reliability - Fault and Failure, Factors Influencing Software, Reliability Models

UNIT III SYSTEM TEST CATEGORIES**10 HOURS**

System test categories Taxonomy of System Tests, Interface Tests Functionality Tests. GUI Tests, Security Tests Feature Tests, Robustness Tests, Boundary Value Tests Power Cycling Tests

Interoperability Tests, Scalability Tests, Stress Tests, Load and Stability Tests, Reliability Tests, Regression Tests, Regulatory Tests. Test Generation from FSM models- State-Oriented Model. Finite-State Machine Transition Tour Method, Testing with State Verification. Test Architectures- Local, distributed, Coordinated, Remote. system test design- Test Design Factors Requirement Identification, modeling a Test Design Process Test Design Preparedness, Metrics, Test Case Design Effectiveness. system test execution- Modeling Defects, Metrics for Monitoring Test Execution. Defect Reports, Defect Causal Analysis, Beta testing, measuring Test Effectiveness.

UNIT IV SOFTWARE QUALITY

10 HOURS

Software quality - People 's Quality Expectations, Frameworks and ISO-9126, McCall 's Quality Factors and Criteria – Relationship. Quality Metrics. Quality Characteristics ISO 9000:2000 Software Quality Standard. Maturity models- Test Process Improvement, Testing Maturity Model- Estimation Techniques.

UNIT V SOFTWARE QUALITY ASSURANCE

8 HOURS

Quality Assurance - Root Cause Analysis, modeling, technologies, standards and methodologies for defect prevention. Fault Tolerance and Failure Containment - Safety Assurance and Damage Control, Hazard analysis using fault-trees and event-trees. Comparing Quality Assurance Techniques and Activities. QA Monitoring and Measurement, Risk Identification for Quantifiable Quality Improvement. Case Study: FSM-Based Testing of Web-Based Applications.

TOTAL: 48 HOURS

TEXT BOOKS:

1. Stephan Goericke.(2019). “*The Future of Software Quality Assurance*”, Stephan Goericke, Second Edition, Springer International Publishing.
2. Sandeep Desai, Abhishek Srivastava. (2018). “*Software Testing: A Practical Approach*”, Second Edition, PHI, New Delhi.
3. Kshirasagar Nak Priyadarshi Tripathy. (2017). “*Software Testing and Quality Assurance- Theory and Practice*”, Second Edition, John Wiley & Sons Inc.

REFERENCE BOOKS:

1. Milind Limaye. (2016). “*Software Quality Assurance*”, Second Edition, TMH ,New Delhi.
2. Jeff Tian. (2016). “*Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement*”, Second Edition, John Wiley & Sons, Inc., Hoboken, New Jersey.
3. Daniel Galin. (2016). “*Software Quality Assurance - From Theory to Implementation*”, First Edition, Pearson Education Ltd UK.

WEBSITES:

1. https://www.tutorialspoint.com/software_testing/software_testing_qa_qc_testing.htm
2. <https://www.altexsoft.com/whitepapers/quality-assurance-quality-control-and-testing-the-basics-of-software-quality-management/>
3. <http://softwaretestingfundamentals.com/software-quality-assurance/>
4. <https://www.softwaretestinghelp.com/software-quality-assurance/>
5. <https://nptel.ac.in/courses/106105150/>
6. <http://ijiet.com/wp-content/uploads/2016/04/15.pdf>
7. <https://www.springer.com/journal/11219>

JOURNAL

1. Manuela Tuteja, Gaurav Dubey " A Research Study on importance of Testing and Quality Assurance in Software Development Life Cycle (SDLC) Models." International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-2, Issue-3, July 2012

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	2	-	3	-	3	-	1	-	-	-	-	-	-	-	-	3	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
CO3	-	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	3	2	3	-	-	-	-	-	-	-	1	-	-	-	-
Average	2	-	3	2	3	1	1	-	-	-	-	-	1	-	-	3	2

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

PREREQUISITE:

- Familiarity with programming languages such as Python, MATLAB, or C++ is essential for implementing algorithms and processing images.

COURSE OBJECTIVES (CO):

- To make the students learn the fundamental theories and techniques of digital image processing.
- To study the mathematical transforms necessary for image processing, image manipulation and a preliminary understanding of Computer Vision.
- To make students to understand the image degradation and enhancement.

COURSE OUTCOMES (COs):

Upon the completion of this course, the students will be able to

COs	Course Outcomes	Blooms Level
CO1	Identify the general terminology, basic concepts of digital image processing	Apply
CO2	Determine the filtering and restoration of images(pixels) with the usage of models	Evaluate
CO3	Examining image compression Technique	Analyze
CO4	Apply the concepts of filtering and segmentation for digital image retrieval.	Apply
CO5	Make use of the concept of restoration and segmentation	Apply

UNIT I INTRODUCTION**10 HOURS**

Digital image processing – Origins of digital image processing- Examples of fields that use digital image Processing-Fundamental steps in digital image processing- Components of an image processing System-Representing digital image.

UNIT II BASIC RELATIONSHIPS BETWEEN PIXELS**10 HOURS**

Basic gray level transformations- Histogram processing - Basic spatial filtering- Smoothing special filtering- Image Degradation/ Restoration process- Noise Models.

UNIT III IMAGE SEGMENTATION**10 HOURS**

Thresholding - Edge Based Segmentation Edge Operators; Line Detection, Corner Detection – Region Based Segmentation Region Growing Based Segmentation, Region Splitting, Region Merging, Split and Merge – Matching. Image Compression: Error Criterion - Lossy Compression - Lossless Compression.

UNIT IV SHAPE REPRESENTATION AND DESCRIPTION**9 HOURS**

Region Identification - Contour Based Representation and Description – Region Based Shape Representation and Description.

Introduction – Statistical Pattern Recognition - Neural Net- Syntactic Pattern Recognition - Graph Matching – Clustering-Texture Image Analysis-Image Data Compression.

TOTAL: 48 HOURS

TEXT BOOKS:

1. Rafael, C. Gonzalez., & Richard, E. Woods. (2018). *“Digital Image Processing”* 3rd ed.. Pearson Education, New Delhi:
2. Milan Sonka., Vaclav Hlavac.,& Roger Boyle. (2017). *“Image Processing Analysis and Machine Vision”* 2nd ed.. Vikas Publishing House. New Delhi
3. Chanda, B., & Dutta Majumder, D. (2016). *“Digital Image Processing and Analysis”*, 1st ed. Prentice Hall of India, New Delhi:

REFERENCE BOOKS:

1. Nick Efford. (2016). *“ Digital Image Processing – A Practical introduction using JAVA ”* 1st ed. Pearson Education Limited., New Delhi
2. Anil K. Jain (2015). *“Fundamentals of Digital Image Processing”*, First Edition, Pearson Education, Inc.,

WEBSITES:

1. <http://www.cs.dartmouth.edu/farid/tutorials/fip.pdf>
2. <http://www.imageprocessingbasics.com/>
3. http://www.astropix.com/HTML/J_DIGIT/TOC_DIG.HTM
4. <https://nptel.ac.in/courses/117105079/>
5. <https://nptel.ac.in/courses/117105135/>

JOURNAL

- 1 .R. Archana and P. S. Eliahim Jeevaraj, **“Deep learning models for digital image processing: a review”**, Volume 57, article number 11, (2024) – Springer.

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO3	-	-	-	3	-	1	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	3	3	-	-	1	-	-	-	-	-	-	-	-	-	-
Average	1	-	3	3	-	1	1	-	-	-	-	-	-	-	-	1	1

1 - Low, 2 - Medium, 3 - High, ‘-’; - No Correlation

PREREQUISITE:

- Fundamentals for understanding uncertainty, distributions, and probabilistic models used in AI/ML.

COURSE OBJECTIVES (CO):

The Objectives of the course are to

- Enable the students to learn the basic functions of AI, Heuristic Search Techniques.
- Provide knowledge on concepts of Representations and Mappings and Predicate Logic.
- Introduce Machine Learning with respect Data Mining, Big Data and Cloud.

COURSE OUTCOMES (COs):

Upon the completion of this course, the students will be able to

COs	Course Outcomes	Blooms Level
CO1	Determine AI problems and techniques	Apply
CO2	Develop intelligent algorithms for constraint satisfaction problems and design intelligent systems for Game Playing.	Apply
CO3	Solve problems with uncertain information using Bayesian approaches.	Analyze
CO4	Develop an appreciation for what is involved in learning from data.	Apply
CO5	Compare the performance of different learning models	Analyze

UNIT I INTRODUCTION**10 HOURS**

Introduction: AI Problems - AI techniques - Criteria for success. Problems, Problem Spaces, Search:

State space search - Production Systems - Problem Characteristics - Issues in design of Search.

UNIT II SEARCH TECHNIQUES**10 HOURS**

Heuristic Search techniques: Generate and Test - Hill Climbing- Best-First, Problem Reduction, Constraint Satisfaction, Means-end analysis. Knowledge representation issues: Representations and mappings -Approaches to Knowledge representations -Issues in Knowledge representations - Frame Problem.

UNIT III PREDICATE LOGIC**10 HOURS**

Using Predicate logic: Representing simple facts in logic - Representing Instance and Is a relationships - Computable functions and predicates - Resolution - Natural deduction. Representing knowledge using rules: Procedural Vs Declarative knowledge - Logic programming - Forward Vs Backward reasoning - Matching - Control knowledge.

UNIT IV MACHINE LEARNING**10 HOURS**

Understanding Machine Learning: What Is Machine Learning?-Defining Big Data-Big Data in Context with

Machine Learning-The Importance of the Hybrid Cloud-Leveraging the Power of Machine Learning-The Roles of Statistics and Data Mining with Machine Learning-Putting Machine Learning in Context-Approaches to Machine Learning.

UNIT V APPLICATIONS OF MACHINE LEARNING

8 HOURS

Looking Inside Machine Learning: The Impact of Machine Learning on Applications - Data Preparation-The Machine Learning Cycle.

TOTAL: 48 HOURS

TEXT BOOKS:

1. Elaine Rich and Kevin Knight, (2017), "*Artificial Intelligence*", Second Edition , Tata McGraw Hill Publishers ,company Pvt Ltd,.
2. George F Luger,(2011), "*Artificial Intelligence*",4th Edition, Pearson Education Publ.
3. Judith Hurwitz, Daniel Kirsch,(2019), "*Machine Learning For Dummies®*", IBM Limited Edition.

REFERENCE BOOKS:

1. Gerhard Welss, (2013), "*Multi Agents Systems*", Second Edition, Tata McGraw Hill Publishers.
2. David L. Poole and Alan K. Mackworth,(2010), "Artificial Intelligence: Foundations of Computational Agents, Fourth Edition,Cambridge University Press.
3. Ethem Alpaydin,(2014), "*Introduction to Machine Learning*", Third Edition. MIT Press, Prentice Hall of India,

WEBSITES:

1. <https://www.javatpoint.com/artificial-intelligence-ai>
2. <https://www.ibm.com/downloads/cas/GB8ZMQZ3>
3. <https://nptel.ac.in/courses/106105077>

JOURNAL

- 1 Akila Sarirete, Zain Balfagih ,Tayeb Brahimi1, Miltiadis, Lytras, and Anna Visvizi, "Artificial intelligence and machine learning research: towards digital transformation at a global scale", Journal of Ambient Intelligence and Humanized Computing (2022) 13:3319–3321

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	-	2	-	3	-	-	-	-	-	-	-	-	-	-	-	3
CO3	3	-	-	2	-	-	-	-	-	1	-	-	-	-	-	-	-
CO4	-	-	2	-	3	-	-	2	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	3	2	-	-	-	-	-	-	-	-	-	-	-
Average	3	-	2	2	3	2	-	2	-	1	-	-	-	-	-	3	3

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

PREREQUISITE:

- Not Required.

COURSE OBJECTIVES (CO):

- To introduce Augmented Reality, the tool of Industry 4.0
- To describe the history and recent developments of AR
- To provide the technological components needed for AR

COURSE OUTCOMES (COs):

Upon the completion of this course, the students will be able to

COs	Course Outcomes	Blooms Level
CO1	To analyze and differentiate networking protocols used in TCP/IP protocol suite.	Analyze
CO2	Determine VR systems work and list the applications of AR	Evaluate
CO3	Analyze and Evaluate VR/AR Technologies.	Analyze
CO4	Apply various types of Hardware and Software in Virtual Reality systems	Apply
CO5	Plan and Formulate Virtual/Augmented Reality Applications	Apply

UNIT I INTRODUCTION TO AUGMENTED REALITY**10 HOURS**

History of AR - Augmented reality characteristics – Difference between Augmented Reality and virtual Reality – AR technological components – Technologies used in AR – Feature Extraction – Hardware components – AR devices – Importance of AR - Real world uses of AR – AR types – Software tools available for AR.

UNIT II TECHNOLOGIES NEEDED FOR AUGMENTED REALITY**10 HOURS**

Hardware technology – virtual scenes – 3D objects – AR components – Display – HMD – Eyeglasses– Contact Lenses – significance of AR – AR powered devices – AR application development drawbacks– Compatibility – Performance – AR libraries – Motion tracking – Environmental understanding –Anchors.

UNIT III TECHNOLOGY INTEGRATION AND IMPLEMENTATION OF AR**10 HOURS**

Technology use and integration in industrial settings – Assistive training to faculty members – Planning and administration for implementation – AR implications – Practical data – AR labs – Platforms to form AR content– Coordinated utilization of AR applications – Hands-on preparation.

UNIT IV AUGMENTED REALITY AND VIRTUAL REALITY FOR MICRO

LEARNING

9 HOURS

Micro learning techniques – Utilizing VR for learning – VR for Practical online assessment – VR infographics – Virtual case considerations - Utilizing AR for learning – Accessible learning – sensible data– elevated learner engagement - VR technology – Components of VR – VR hardware – VR applications– Civil Engineering – Real Estate – Biology and Medicine – Virtual Mall – VR in Education – VirtualLaboratory – Factory Planning – Automobile Industry.

UNIT V TOOLS AND APPLICATIONS OF AUGMENTED REALITY

9 HOURS

Tools available for Augmented Reality and Recognition – Software Tools – Google Poly – Unity –software approaches – recognition types – native software solutions – ARKit – ARCore – software development kit - Cloud services - AR business applications – weather prediction – market prediction– smart cities - AR application for Education - AR application for Healthcare sector – Agriculture –Civil Engineering – Architecture – Archaeology – Crime and Security – Games – IoT - – Use cases –Social Media – Gaming – Education – Healthcare – Shopping and Business.

TOTAL:48 HOURS

TEXT BOOKS:

1. Kaliraj, P., Devi, T. (2021). *“Innovating with Augmented Reality: Applications in Education and Industry”* 1st ed. CRC Press, Taylor & Francis Group, Boca Raton, ebook ISBN 9781003175896 Auerbach Publications. <https://doi.org/10.1201/9781003175896>.
2. Alan B. Craig,(2013), *“ Understanding Augmented Reality, Concepts and Applications”*, Second Edition, Morgan Kaufmann.ebook.
3. Hassanien, A. E., Gupta, D., Khanna, A., Slowik, A., (2022), *“Virtual and Augmented Reality for Automobile Industry: Innovation Vision and Applications,”* Springer, ISBN: 9783030941017.

REFERENCE BOOKS:

1. Schmalstieg, D., Höllerer, T., (2016), *“Augmented Reality: Principles & Practice,”* Third Edition, Pearson, ISBN: 9789332578494
2. Kaliraj P, Devi T, (2021). *“Innovating with Augmented Reality: Applications in Education and Industry”* 1st ed. Auerbach Publications.

WEBSITES:

1. <https://nptel.ac.in/courses/121106013>
2. <https://www.youtube.com/watch?v=zLMgdYI82IE>
3. <https://www.youtube.com/watch?v=MGuSTAqIz9Q>
4. <http://cambum.net/course-2.htm>

JOURNAL

1.Samala, A.D., Usmeldi, Taali, Daineko, Y., Indarta, Y., Nando, Y.A., Anwar, M., Jaya, P., Almasri. (2023). Global Publication Trends in Augmented Reality and Virtual Reality for Learning: The Last Twenty-One Years. International Journal of Engineering Pedagogy (IJEP), 13(2), pp. 109–128. <https://doi.org/10.3991/ijep.v13i2.35965>

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	-	-	-	-	2	-	-	-	1	-	-	-	-	-	-	2	-
CO2	-	-	1	-	-	-	-	-	-	-	3	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	2	2	-	-	-	-	-	3	-	-	-	-	-	-
Average	3	-	1	2	2	-	-	-	1	-	3	-	-	-	-	2	-

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

PREREQUISITE:

- Understanding basic computer science concepts like algorithms, data structures, and computational thinking can be helpful, especially for the programming aspects of robotics.

COURSE OBJECTIVES (CO):

- To provide an introduction to Robotics and Automation including robot classification, design and selection, analysis and applications in industry.
- To provide information on various types of end effectors, their design, interfacing and selection.
- To provide the details of operations for a variety of sensory devices that are used on robot, the meaning of sensing, classification of sensor, that measure position, velocity & acceleration of robot joint.

COURSE OUTCOMES (COs):

Upon the completion of this course, the students will be able to

COs	Course Outcomes	Blooms Level
CO1	Explain the basic elements of industrial robots	Evaluate
CO2	Analyze different types of robots	Analyze
CO3	Analyze robot kinematics and its control methods.	Analyze
CO4	Determine the sensors used in robotics applications work.	Evaluate
CO5	Utilize various path planning techniques	Apply

UNIT I INTRODUCTION**10 HOURS**

Introduction: Definition and origin of robotics – Different types of robotics – Generation of robots – degrees of freedom -Asimov's law of robotics – dynamic stabilization of robots

UNIT II POWER SOURCES, SENSORS AND GRIPPERS**10 HOURS**

Power Sources, Sensors and Grippers: Different kind of drives - Hydraulic, Pneumatic and electric – Determination of HP and Gear Ratio of motors – Steering Control – PWM, Differential drives – Sensors-Range Detectors, Machine Vision, Tactile Sensors – Robot Manipulator – Construction, Dynamics and Control -Different kind of end effectors and grippers – Design Considerations

UNIT III KINEMATICS AND PATH PLANNING**10 HOURS**

Kinematics and Path Planning: Forward and Inverse Kinematic Equations – Multiple Solution Jacobian Work Envelop – Hill Climbing Methods -Various Robot Programming Languages

UNIT IV ROBOT OPERATING SYSTEM**9 HOURS**

Robot Operating System: Robot Software platform and its needs – Meta Operating System - History of ROS and ecosystem – ROS development environment – Communication concepts of ROS – ROS Commands – ROS Tools

UNIT V PROGRAMMING WITH ROS**9 HOURS**

Programming with ROS: Creating Subscriber and Publisher Nodes – Parameters setting and reading across nodes – TurtleBot 3 development environment setup-Software, Hardware – TurtleBot 3 Simulation with Gazebo – Pre-determined Robot sequence programming in Gazebo

TOTAL:48 HOURS**TEXT BOOKS:**

1. Mikell P. Groover, Mitchell Weiss, Roger N. Nagel, Nicholas G. Odrey,(2010), “*Industrial Robotics: Technology, Programming, and Applications*”.Fourth Edition,Tata McGraw Hill Publications.
2. Bijoy k. Ghosh(2019), “*Control in Robotics and Automation: Sensor-Based Integration*” Second Edition, Tata McGraw Hill Publications.
3. YoonSeokPyo, HanCheol Cho, RyuWoon Jung, TaeHoon Lim, (2015),“*ROS Robot Programming*” Third Edition, Publisher: Wiley.

REFERENCE BOOKS

1. Morgan Quigley, Brian Gerkey, William D. Smart,(2010), “*Programming Robots with ROS: A Practical Introduction to the Robot Operating System*” Fourth Edition, Publisher: Wiley
2. Roland Siegwart and Illah R. Nourbakhsh, “*Introduction to Autonomous Mobile Robots*” Getting Started with Robotics , Second Edition, Wiley Publisher.
3. Saeed Niku(2011), “*Introduction to Robotics: Analysis, Control, Applications*” 2nd Edition, Publisher: Wiley.
4. John Craig (2017), “*Introduction to Robotics: Mechanics and Control*”,4th Edition, Publisher: Pearson.

WEBSITES:

1. [.https://see.stanford.edu/Course/CS223A](https://see.stanford.edu/Course/CS223A)

JOURNAL

- 1 .Luigi Pagliarini, Henrik Hautop Lund, “ The future of Robotics Technology”, Journal of Robotics, Networking and Artificial Life, Vol. 3, No. 4 (March 2017), 270-273.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	-	-	-	-	2	-	-	3	-	-	-	-	-	-	-	-	-
CO2	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	3
CO3	3	-	2	1	-	1	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
CO5	3	-	-	-	2	-	-	3	-	-	-	-	1	-	-	-	-
Average	3	-	2	1	2	1	-	3	-	-	-	-	1	-	-	-	3

1 - Low, 2 - Medium, 3 - High, ‘-’; - No Correlation

PREREQUISITE:

- Understanding of basic artificial intelligence concepts is crucial. This includes knowledge of search algorithms, knowledge representation and reasoning, machine learning algorithms, and decision-making under uncertainty.

COURSE OBJECTIVES (CO):

- To gain insight about automation using Intelligent Agents
- To understand the learning behavior and functioning of Agents
- To develop knowledge in the application domains of Agents

COURSE OUTCOMES (COs):

Upon the completion of this course, the students will be able to

COs	Course Outcomes	Blooms Level
CO1	Determine the basic theoretical foundations of common intelligent systems	Evaluate
CO2	Applied artificial intelligence techniques	Apply
CO3	Analyze various agent negotiation strategies	Analyze
CO4	Build the multiagent systems	Apply
CO5	Evaluate current trends and applications of intelligent agents	Evaluate

UNIT I INTRODUCTION**10 HOURS**

Introduction to Intelligent Autonomous Agents- Motivations for agent-based computing - Abstract Architectures for Intelligent Agents - Key concepts and models of reasoning agents – deductive reasoning - symbolic reasoning - reactive reasoning - practical reasoning - Rational decision making and handling uncertainty.

UNIT II AGENT INTERACTIONS**10 HOURS**

Agent Interactions – Communication and cooperation – Ontology fundamentals – Building blocks – Ontology Languages – Software tools for ontologies – Agent Communication Languages. Conceptual Foundations of Communication in Multiagent systems - Traditional Software Engineering Approaches - Traditional AI Approaches - Commitment-Based Multiagent Approaches - Engineering with Agent Communication

UNIT III COOPERATIVE DISTRIBUTED PROBLEM SOLVING**10 HOURS**

Cooperative Distributed Problem Solving - Task Sharing and Result Sharing - Coordination - Multiagent Planning and Synchronization - Negotiation and Bargaining - Aspects of Negotiation - Game-Theoretic Approaches for Single-Issue Negotiation - Game-Theoretic Approaches for Multi-Issue Negotiation - Heuristic Approaches for Multi-Issue Negotiation -Argumentation-Based Negotiation

UNIT IV MACHINE LEARNING**9 HOURS**

Multiagent Learning - Introduction - Challenges in Multiagent Learning - Reinforcement Learning for Multiagent Systems - Evolutionary Game Theory as a Multiagent Learning paradigm - Swarm Intelligence as a Multiagent Learning Paradigm -Neuro-Evolution as a Multiagent Learning Paradigm - Case Study in Multiagent Learning

UNIT V AGENT APPLICATIONS

9 HOURS

Agent Applications - Agents for Workflow and Business Process Management - Agents for Distributed Sensing - Agents for Information Retrieval and Management - Agents for Electronic Commerce - Agents for Human–Computer Interfaces - Agents for Virtual Environments - Agents for Social Simulation - Deploying agents within a simulated environment - Practical reasoning strategies for computational markets

TOTAL:48 HOURS

TEXTBOOKS:

1. Michael Wooldridge(2009), “ *An Introduction to Multi Agent Systems*” 2nd ed”Wiley.
2. G. Weiss (2013), “ *Multi-Agent Systems - A Modern Approach to Distributed Artificial Intelligence*”,2nd ed. MIT Press.
3. M. Wooldridge(2000), “ *Reasoning about Rational Agents*”. Second Edition, MIT Press.

REFERENCE BOOKS:

1. Yoav Shoham, Kevin Leyton-Brown, (2008), “*Multiagent Systems: Algorithmic, Game-Theoretic, and Logical Foundations*”, Second Edition, MIT Press.

WEBSITES:

1. <https://nptel.ac.in/courses/106/105/106105077/>

JOURNAL

- 1 .Ralf Schleiffer, “**An intelligent agent model**, *European Journal of Operational Research* , Volume 166, Issue 3, 1 November 2005, Pages 666-693.

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	-	-	2	-	3	-	-	3	-	-	-	-	-	-	-	3	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
CO3	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	-	2	-	-	3	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	3	-	-	-	-	-	-	1	-	-
Average	2	-	2	1	3	3	-	3	-	-	-	-	-	-	1	3	2

1 - Low, 2 - Medium, 3 - High, ‘-’; - No Correlation

PREREQUISITE:

- Understanding of Java programming language fundamentals, including object-oriented programming concepts (classes, objects, inheritance, polymorphism), exception handling, multithreading, and I/O operations.
- Servlets are Java programs that run on the server-side to handle client requests. JavaServer Pages (JSP) are web pages with embedded Java code that are translated into servlets. Familiarity with servlet lifecycle, request handling, session management, and JSP syntax is essential.

COURSE OBJECTIVES (CO):

- To Understand the In-depth concepts of J2EE.
- To Understand the in-depth Life cycle of servlets and JSP.
- To Learn how to communicate with databases using Java.

COURSE OUTCOMES (COs):

Upon the completion of this course, the students will be able to

COs	Course Outcomes	Blooms Level
CO1	Able to Solve Problems using java collection framework and I/o classes.	Apply
CO2	Students get to access database through Java programs, using Java Database Connectivity (JDBC)	Apply
CO3	Construct elementary modifications to Java programs that solve real-world problems.	Apply
CO4	Make use of reusable software component, using Java Bean	Apply
CO5	Discover dynamic web pages, using Servlets and JSP	Analyze

List of Programs

1. Write a program to create a sign form in servlets.
2. Write a servlet Program to lock a server.
3. Write a servlet program that returns list of information in table format.
4. Design a counter that counts number of times user has visited the site in current browsing session.
5. Write a program to retrieve cookies information
6. Build a JAVA Bean for opening an applet from JAR file.
7. Write a program to add controls in BEAN.
8. Design a counter in JAVA BEAN.
9. Write a program to stream contents of a file using JSP.
10. Write a program to insert an applet into JSP page.
11. Write a program to create JDBC connectivity with Oracle Database.
12. Write a program to create RMI client and server to invoke remove method of RMI server

TOTAL:48 HOURS

TEXT BOOKS:

1. Jim Keogh. (2018). *“The Complete Reference J2EE”*, 1st edition, ; Tata McGraw Hill. New Delhi
2. Duane, K. Fields., & Mark, A. Kolb. (2017). *“Web Development with Java Server Pages”* 1st ed.. Pune: Manning Publications.
3. Rod Johnson. (2017). *“J2EE Development without EJB”* 1st edition. New Delhi:Wiley Dream Tech.

REFERENCE BOOKS:

1. Rod Johnson., & Rod Johnson, P.H. (2016). *“ Expert One-On-One J2EE Design and Development”*. First Edition,John Wiley & Sons. New Delhi:
2. Paul, J. Perrone., Venkata, S. R. Chaganti., Venkata S. R. Krishna., & Tom Schwenk. (2016). *“J2EE Developer's Handbook”*,First Edition, Sams Publications. New Delhi:
3. Joseph, J. Bambara et al. (2016). *“J2EE Unleashed”*, 1st ed..Tech Media. New Delhi

WEBSITES:

1. <https://www.oracle.com/technetwork/java/javaee/appmodel-135059.html>
2. <https://www.geeksforgeeks.org/introduction-java-servlets/>
3. <http://media.datadirect.com/download/docs/jdbc/alljdbc/jdbcconnect/j2ee.html>
4. <https://www.javatpoint.com/ejb-tutorial>
5. <https://www.javatpoint.com/jsp-tutorial>
6. <https://nptel.ac.in/courses/106105191/>

JOURNAL

1. Aeiman Gadafi, Daniel Hagimont ,Laurent Broto ,Remi Sharrock ,Alain Tchana and Noel De Palma
Published Online: February 6, 2014pp 54-72 <https://doi.org/10.1504/IJAC.2014.059112>.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	2	-	3	-	-	-	-	-	-	-	2	-	-	-	-	3	-
CO2	-	-	3	-	-	-	-	-	3	-	-	-	2	-	-	-	2
CO3	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	2	-	3	-	-	-	-	-	2	-	-
Average	2	-	3	-	1	-	2	-	3	-	2	-	2	-	2	3	2

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

24CSP312

**SOFTWARE TESTING AND QUALITY ASSURANCE -
PRACTICAL**

3H - 2C

Instruction Hours/week: L:0 T:0 P:3

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

PREREQUISITE:

- Understanding the phases of SDLC (Requirements gathering, Design, Development, Testing, Deployment, Maintenance).
- Understanding of test planning, test case design, test execution, defect reporting, and tracking

COURSE OBJECTIVES (CO):

- To understand the basics of testing, test planning & design and test team organization
- To study the various types of tests in the life cycle of the software product.
- To build design concepts for system testing and execution

COURSE OUTCOMES (COs):

Upon the completion of this course, the students will be able to

COs	Course Outcomes	Blooms Level
CO1	Determine the quality assurance process and its role in software development.	Evaluate
CO2	Determine variety of testing techniques, methods, and tools	Evaluate
CO3	Plan the test cases for different applications.	Apply
CO4	Identify defect prevention techniques and software quality assurance metrics.	Apply
CO5	Apply systematic procedure for software design and deployment.	Apply

List of Programs**Using Testing Tool: (Selenium)**

1. Conduct a test suite for any two WEB LINKS.
2. Program to Select Checkbox in Selenium Driver.
3. Program to Select Radio Button in Selenium Driver.
4. Write a Program to Scroll a web page in Selenium WebDriver.
5. Write and test a program to login a specific webpage.
6. Create Locators in Selenium using IDE.
7. Find Element and Find Elements in Web using Selenium WebDriver.

TOTAL:48 HOURS**TEXT BOOKS:**

1. Stephan Goericke. (2019). *“The Future of Software Quality Assurance, Stephan Goericke”*, Springer International Publishing.
2. Sandeep Desai, Abhishek Srivastava. (2018). *“Software Testing: A Practical Approach”*. First Edition, PHI, New Delhi.
3. Kshirasagar Nak Priyadarshi Tripathy. (2017). *“Software Testing and Quality Assurance- Theory and Practice”*, First Edition, John Wiley & Sons Inc.

REFERENCE BOOKS:

1. Milind Limaye.(2016). “*Software Quality Assurance*”, First Edition, TMH ,New Delhi.
2. Jeff Tian. (2016). “ *Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement*”, First Edition, John Wiley & Sons, Inc., Hoboken, New Jersey.
3. Daniel Galin. (2016). “ *Software Quality Assurance - From Theory to Implementation*”, Third Edition, Pearson Education Ltd UK.

WEBSITES:

1. https://www.tutorialspoint.com/software_testing/software_testing_qa_qc_testing.htm
2. <https://www.altexsoft.com/whitepapers/quality-assurance-quality-control-and-testing-the-basics-of-software-quality-management/>
3. <http://softwaretestingfundamentals.com/software-quality-assurance/>
4. <https://www.softwaretestinghelp.com/software-quality-assurance/>
5. <https://nptel.ac.in/courses/106105150/>
6. <http://ijiet.com/wp-content/uploads/2016/04/15.pdf>
7. <https://www.springer.com/journal/11219>

JOURNAL

1. Manuela Tuteja, Gaurav Dubey " **A Research Study on importance of Testing and Quality Assurance in Software Development Life Cycle (SDLC) Models.**" International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-2, Issue-3, July 2012

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	2	-	3	-	3	-	1	-	-	-	-	-	-	-	-	2	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	3	2	3	-	-	-	-	-	-	-	1	-	-	-	-
Average	2	-	3	2	3	1	1	-	-	-	-	-	1	-	-	2	-

1 - Low, 2 - Medium, 3 - High, ‘-’; - No Correlation

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**

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

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 of income 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,

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 Hill Education, New York.
2. Halan, M. (2018). *Let's Talk Money: You've Worked Hard for It, Now Make It Work for 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	PO11	PO12	PO13	PO14	PO15	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

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 skills 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
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

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 Data Tables & 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 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 Robot from 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. Newyork
2. Frank Casale , Rebecca Dilla, Heidi Jaynes , Lauren Livingston.(2015). *Introduction to Robotic Process Automation:a Primer*, Institute of Robotic Process Automation,1st Edition. Pearson Publication, New Delhi
3. Richard Murdoch. (2018). *Robotic Process Automation: Guide to Building Software Robots, Automate Repetitive Tasks & Become an RPA Consultant*, Independently Published, 1st Edition. Pearson Publication, New Delhi

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. Pearson Publication, New Delhi
2. Lim Mei Ying. (2018). *Robotic Process Automation with Blue Prism Quick Start Guide: Create software robots and automate business processes*, Packt Publishing, 1st Edition. Pearson Publication, New Delhi

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

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.

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

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.

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. New York
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

24PHPOE301

ELECTRICAL APPLIANCES AND SERVICING

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 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

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 Ra Publishing Co. (Pvt) Ltd.

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	PS O1	PS O2
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

PREREQUISITE:

Not required

COURSE OBJECTIVES (CO):

- To study the use of microorganisms in the manufacture of food or industrial products on 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	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
CO3	2	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	3
CO4	-	-	-	2	-	2	-	3	-	-	2	-	-	-	-	-	3
CO5	-	-	-	2	-	2	-	3	-	-	2	-	-	-	2	-	3
Average	2.7	-	-	2	-	2	-	3	-	-	2	-	-	-	2	-	3

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

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 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
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
Average	3	-	-	-	-	-	-	2	2	-	2	2	2	-	2	2	2

1-Low; 2-Medium; 3-Strong; ‘-’ No correlation

