

MASTER OF COMPUTER APPLICATIONS (MCA)
CHOICE BASED CREDIT SYSTEM (CBCS)

Curriculum and Syllabus
Regular (2023 – 2024)



DEPARTMENT OF COMPUTER APPLICATIONS
FACULTY OF ARTS, SCIENCE, COMMERCE AND MANAGEMENT (FASCM)

KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed to be University)

(Established Under Section 3 of UGC Act, 1956)

(Accredited with A+ Grade by NAAC in the Second Cycle)

Eachanari (Post), Coimbatore – 641 021.

Tamilnadu, India

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FACULTY OF ARTS, SCIENCE, COMMERCE AND MANAGEMENT (FASCM)
POST – GRADUATE PROGRAMME
(MCA)
(REGULAR PROGRAMME)

REGULATIONS
(2023)

CHOICE BASED CREDIT SYSTEM (CBCS)

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FACULTY OF ARTS, SCIENCE, COMMERCE AND MANAGEMENT

MCA DEGREE PROGRAMME

REGULAR MODE

REGULATIONS - 2023

The following Regulations are effective from the academic year 2023-2024 and are applicable to the candidates admitted in the MCA degree programme in the Faculty of Arts, Science, Commerce and Management, Karpagam Academy of Higher Education.

1 PROGRAMME OFFERED

MCA - MASER OF COMPUTER APPLICATIONS

MODE OF STUDY AND ADMISSION REQUIREMENTS

1.1 MODE OF STUDY

Full-Time:

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

1.2 ADMISSION REQUIREMENTS (Eligibility)

Regular candidates for admission to the first semester of the MCA Degree Programme shall be required to have passed any Degree Examination with mathematics at +2 level or any degree with at least one course in maths/business maths/statistics at any degree level of this Karpagam Academy of Higher Education or any other University accepted by the Karpagam Academy of Higher Education as equivalent thereto.

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
MCA (Regular)	4	8

- 2.2 Each semester consists typically of 90 working days (with 7 hours per day) or 630 hours for a full-time mode of study. The examination shall be conducted at the end of every semester for the respective courses.

3. CHOICE BASED CREDIT SYSTEM

- 3.1 This programme is offered under Choice Based Credit System with the total credits of 91 for MCA Regular candidates.

3.2 Credits

Credits means the weightage given to each course of study by the experts of the Board of Studies concerned.

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. Core course

Core course consists of theory and practical and the examinations shall be conducted at the end of each semester.

b. Elective course

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.

In case the candidate undertakes the project work outside the Department, the teacher concerned within the Department shall be the Main guide and the teacher/scientist under whom the work is carried out will be the Co-Guide. The candidate shall bring the attendance certificate from the place where the project work was carried out.

d. Value Added Courses

Courses of varying durations but not less than 30 hours which are optional and offered outside the curriculum that add value and help the students in getting placement. Students of all programmes are eligible to enroll for the Value Added Courses. The student shall choose one Value Added Course per semester from the list of Value Added Courses available in KAHE. The examinations shall be conducted at the end of the Value Added Course at the

Department level and the student has to secure a minimum of 50% of marks to get a pass. The certificate for the Value Added Course for the passed out students shall be issued duly signed by the HOD and Dean of the Faculty concerned.

e. Internship

The student shall undergo 15 days internship in 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. 100 marks is awarded for Internship through Continuous Internal Assessment.

f. Open Elective

The student 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 02 credits for this course. (The student cannot select a course offered by the parent department).

S.No.	Name of the Department	Course Code	Name of the Course
1	M.A English	23EGPOE301	English for Competitive Examinations
2	M.Com	23CMPOE301	Personal Finance and Planning
3	MBA	23MBAPOE301	Organizational Behavior
4	MCA	23CAPOE301	Robotics Process Automation
5	M.Sc Computer Science	23CSPOE301	Cyber Forensics
6	M.Sc Mathematics	23MMPOE301	Coding theory
7	M.Sc Physics	23PHPOE301	Material Characterization
		23PHPOE302	Numerical Methods and Programming
8	M.Sc Chemistry	23CHPOE301	Chemistry in Everyday Life
9	M.Sc Microbiology	23MBPOE301	Fermentation Technology
10	M.Sc Biochemistry	23BCPOE301	Nutrition and Dietetics
11	M.Sc Biotechnology	23BTPOE301	Sericulture

g. Online Course

Student shall study at least one online course from SWAYAM / NPTEL / MOOC in any one of the first three semesters for which examination shall be conducted at the end of the course by the respective external agencies if any. The student can register to the courses which are approved by the Department. The student shall produce a Pass Certificate from the respective agency before the end of the third semester. The credit(s) earned by the students will be considered as additional credit(s) over and above the credits minimum required to earn a particular Degree.

5. MEDIUM OF INSTRUCTION

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

6. MAXIMUM MARKS

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

- (i) Each of the theory and practical courses shall carry a 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

Sl. No.	Programme	Maximum marks	CIA	ESE
1	MCA	200	80	120

7. 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 a faculty mentor throughout their period of study. Faculty mentors shall advise the students and monitor their behaviour and academic performances. Problems, if any, they shall be counselled by the mentor periodically. The Faculty mentor is also responsible for informing the parents on the progress of their wards. Faculty mentor shall display the cumulative attendance particulars of his / her ward students' periodically (once in 2 weeks) on the Notice Board to enable the students to know their attendance status and satisfy clause 7 of this regulation.

b. ONLINE COURSE COORDINATOR

To help students plan their online courses and for general advice on online courses, the HOD shall nominate a coordinator for the online courses. The Online course coordinator shall identify the courses that students can select from the available online courses offered by the different agencies periodically and inform the students.

Further, the coordinators shall advise the students regarding the online courses and monitor their courses.

8. 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 concerned HoD / senior faculty as a Chairperson. The objective of the Class Committee Meeting is all about the teaching – learning process. Class Committee shall be convened at least once in a month. The 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 of the class committee.
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 working days after 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.

9. COURSE COMMITTEE FOR COMMON COURSES

Each common theory course offered to more than one discipline or group shall have a “Course Committee” comprising all the teachers handling the common course with one of them nominated as course coordinator. The nomination of the course coordinator shall be made by the Dean depending upon whether all the teachers handling the common course belong to a single department or to various other departments. The ‘Course Committee’ shall meet in order to arrive at a common scheme of

evaluation for the tests to ensure a uniform evaluation of the tests. If feasible, the course committee shall prepare a common question paper for the Internal Assessment test(s).

10. REQUIREMENTS TO APPEAR FOR THE END SEMESTER EXAMINATION

- a. Ideally 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. However, the candidate has to pay the prescribed condonation fee to KAHE.
- c. However, a candidate who has secured attendance less than 65% in the current semester due to any reason shall not be permitted to appear for the current semester examinations. But he/she will be permitted to appear for his/her supplementary examinations, if any and he/she has to re-do the same semester with the approval of the Dean, Students Affairs and 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 class, the test marks and the record of class work (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 to respective Dean once in a fortnight. 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. The 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 (first 2 ½ units)	10
3	Test – II (last 2 ½ units)	10
4	Journal Paper Analysis & Presentation*	15
Continuous Internal Assessment : Total		40

*Evaluated by two faculty members of the department concerned. Distribution up 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
Continuous Internal Assessment: 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 Pattern of Test Question Paper

Instruction	Remarks
Maximum Marks	50 marks
Duration	2 Hours
Part – A	Objective type (20x1=20)
Part - B	Short Answer Type (3 x 2 = 6)
Part - C	3 Eight marks questions ‘either – or’ choice (3 x 8 = 24 Marks)

11.4 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 60 marks.

Pattern of ESE Question Paper

Instruction	Remarks
Maximum Marks	60 marks for ESE
Duration	3 hours (½ Hr for Part – A Online & 2 ½ Hours for Part – B and C)
Part – A	20 Questions of One mark each (20 x 1 = 20 Marks) Question No. 1 to 20 Online Multiple Choice Questions
Part- B	5 Questions of Six marks each (5 x 6 = 30 Marks.) Question No. 21 to 25 will be ‘either-or’ type, covering all five units of the syllabus; i.e.,

Instruction	Remarks
	Question No. 21: Unit - I, either 21 (a) or 21 (b), Question No. 22: Unit - II, either 22 (a) or 22 (b), Question No. 23: Unit - III, either 23 (a) or 23 (b), Question No. 24: Unit - IV, either 24 (a) or 24 (b), Question No. 25: Unit - V, either 25 (a) or 25 (b)
Part - C	Question No.26. One Ten marks Question (1 x 10 = 10 Marks)

12.2 Practical: There shall be combined valuation. The pattern of distribution of marks shall be as given below.

Experiments	: 40 Marks
Record	: 10 Marks
<i>Viva-voce</i>	: 10 Marks
Total	: 60 Marks

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 in the subsequent appearances also by the candidate.

12.3. Evaluation of Project Work

12.3.1 The project shall carry a maximum marks as per 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 re-submit 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: There is a passing minimum 20 marks out of 40 marks for CIA and the passing minimum is 30 marks out of 60 marks in ESE. The overall passing in each course is 50 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 13.1, 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 secures a 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 CIA marks (if it is pass) obtained by the candidate in the first appearance 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 for ESE in a Theory 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

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:

- The list of courses enrolled during the semester and the corresponding grade scored.
- The Grade Point Average (**GPA**) for the semester and
- 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

$$\text{CGPA of the entire programme} = \frac{\text{Sum of the credits of the courses of the entire programme}}{\text{Sum of the credits of the courses of the entire programme}}$$

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

where,

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

$G P_i$ 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 retotalling 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 is allowed on representation (clause 17). Student may get the Xerox copy of the answer script on payment of prescribed fee, if he / she wishes. 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.
- Not any disciplinary action pending 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 13) 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 13) 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 20.1 and 20.2) who qualify for the award of the degree (vide Clause 19) shall be declared to have passed the examination in **Second Class**.

21 PROVISION FOR WITHDRAWAL FROM END-SEMESTER EXAMINATION

21.1 A candidate due to valid reason on prior application may be granted permission to withdraw from appearing for the examination of any one course or consecutive examinations of more than one course in a semester examination.

21.2 Such withdrawal shall be permitted only once during the entire period of study of the degree programme.

21.3 Withdrawal of application is valid only if it is made within 10 days prior to the commencement of the examination in that course or courses and recommended by the HoD / Dean concerned and approved by the Registrar.

21.3.1.1 Notwithstanding the requirement of mandatory TEN days notice, applications for withdrawal for special cases under extraordinary conditions will be considered on the merit of the case.

21.4 Withdrawal shall not be construed as an appearance for the eligibility of a candidate for First Class with Distinction. This provision is not applicable to those who seek withdrawal during IV semester.

21.5 Withdrawal from the End semester examination is **NOT** applicable to arrear courses of previous semesters.

21.6 The candidate shall reappear for the withdrawn courses during the examination conducted in the subsequent semester.

22 PROVISION FOR AUTHORISED BREAK OF STUDY

22.1 **Break of Study shall be granted only once for valid reasons for a maximum of one year during the entire period of study of the degree programme.** However, in extraordinary situation the candidate may apply for additional break of study not exceeding another one year by paying prescribed fee for break of study. If a candidate intends to temporarily discontinue the programme in the middle of the semester for valid reasons, and to rejoin the programme in the subsequent year, permission may be granted based on the merits of the case provided he / she applies to the Registrar, but not later than the last date for registering for the end semester examination of the semester in question, through the HoD stating the reasons therefore and the probable date of rejoining the programme.

22.2 The candidate thus permitted to rejoin the Programme after the break shall be governed by the Curriculum and Regulations in force at the time of rejoining. Such candidates may have to do additional courses as per the Regulations in force at that period of time.

22.3 The authorized break of study (for a maximum of one year) will not be counted for the duration specified for passing all the courses for the purpose of classification. (Vide Clause 20). However, additional break of study granted will be counted for the purpose of classification.

22.4 The total period for completion of the Programme reckoned from, the commencement of the first semester to which the candidate was admitted shall not exceed the maximum period specified in clause 2.1 irrespective of the period of break of study (vide clause 22.3) in order that he/she may be eligible for the award of the degree.

- 22.5 If any student is detained for want of requisite attendance, progress and good conduct, the period spent in that semester shall not be considered as permitted 'Break of Study' or 'Withdrawal' Clause 21 and 22 are not applicable for this case.

23 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.

24 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.

25 DISCIPLINE

25.1. 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.

25.2. 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.

26 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.

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

- 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
- 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).
- Start Up activities will be evaluated based on the guidelines being given by the expert committee of the KIIC
- Student Entrepreneurs may use the address of incubation center (KIIC) to register their venture while studying in KAHE.
- 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)
- 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.
- 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 / Coursetitle	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

On successful completion of the program the student attains

- a. Engineering Knowledge: Apply the knowledge of mathematics and computing fundamentals to various real time applications for any given requirement
- b. Problem Analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- c. Design / Development of Solutions: Design solutions for complex problems and design system components or processes that meets the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- d. Conduct Investigations of Difficult Problems: Use research-based information and methods including design of applications, analysis and interpretation of data, and synthesis of the information to provide valid results.
- e. Recent Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to advanced software engineering activities with an understanding of the limitations.
- f. The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- g. Environment and Sustainability: Understand the impact of the software engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- h. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- i. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse groups, and in multidisciplinary scenarios.
- j. Communication: Communicate effectively on different engineering activities with the IT community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- k. Project Management and Finance: Demonstrate knowledge and understanding of the computer engineering and management principles and apply these techniques as a member and as leader in a team, to manage projects and in multidisciplinary environments.

l. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OBJECTIVES (PSOs):

m. Enable the students to select the suitable data model, appropriate architecture and platform to implement a system with high performance.

n. Enable the students to design and integrate various system-based modules to provide user interactive solutions for various challenges.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO I: To enable the students to excel in the computing profession by providing high technical foundations in the field of computer applications.

PEO II: To provide students with various computing skills like analysis, design and development of innovative software products to meet the industry needs.

PEO III: To motivate students to pursue lifelong learning and to do research as computing experts and scientists.

PEO IV: To encourage students to communicate and function effectively in teams in multidisciplinary fields within the global, social and environmental context.

MAPPING of PEOs and POs

POs	a	b	c	d	e	f	g	h	i	j	k	l
PEO1	X	X	X	X	X							
PEO2		X	X	X		X		X		X	X	X
PEO3			X		X	X	X		X		X	X
PEO4	X	X			X	X		X		X	X	X

DEPARTMENT OF COMPUTER APPLICATIONS
FACULTY OF ARTS, SCIENCE, COMMERCE AND MANAGEMENT (FASCM)
PG PROGRAM (CBCS)
MASTER OF COMPUTER APPLICATIONS (MCA)
(2023–2024 Batch and onwards)

Course Code	Name of the Course	Objectives and out comes		Instruction			Credit(s)	Maximum Marks			Page No.
				Hours / Week							
		PEOs	POs	L	T	P		CIA	ESE	Total	
40	60							100			
SEMESTER - I											
23CAP101	PHP5/MySQL	I	c,d	4	-	-	4	40	60	100	1
23CAP102	Computer Networks	I-III	a,b,c,e,f,l	4	-	-	4	40	60	100	4
23CAP103	Design and Analysis of Algorithms	I-III	b,c,e	4	-	-	4	40	60	100	7
23CAP104	Statistical Computing	II,III	a,b,c,d,e	4	-	-	3	40	60	100	9
23CAP105	Organizational Behaviour	I-IV	a,f,g,h,i,j,k,l	4	-	-	3	40	60	100	12
23CAP111	PHP5/MySQL -Practical	I	c,d	-	-	5	2	40	60	100	15
23CAP112	Computer Networks-Practical	I-III	a,b,c,e,f,j,l	-	-	4	2	40	60	100	17
23CAP113	Design and Analysis of Algorithms - Practical	I-III	b,c,e	-	-	4	2	40	60	100	19
	Journal Paper Analysis & Presentation	-	-	2	-	-	-	-	-	-	-
Semester Total		-	-	22	-	13	24	320	480	800	-
SEMESTER – II											
23CAP201	J2EE	I-III	a,b,c,d,e,i	4	-	-	4	40	60	100	21
23CAP202	Mobile Computing	I-III	a,b,c,d,e,f, g	4	-	-	3	40	60	100	24
23CAP203	Artificial Intelligence	I-IV	a,f,g,h,i,j,k,l	4	-	-	3	40	60	100	27
23CAP204	Elective I *	I-III	a,b,c,e	4	-	-	4	40	60	100	30
23CAP205	Elective II *	I-III	a,b,c,e,g,k	4	-	-	4	40	60	100	42
23CAP211	J2EE-Practical	I-III	a,b,c,d,e,i,k, l	-	-	5	2	40	60	100	54

23CAP212	Mobile Computing- Practical	I-III	a,b,c, d,e,f, g,h	-	-	4	2	40	60	100	56
23CAP213	Elective I– Practical *	I-III	a,b,c,e	-	-	4	2	40	60	100	58
	Journal Paper Analysis & Presentation	-	-	2	-	-	-	-	-	-	
Semester Total		-	-	22	-	13	24	320	480	800	
SEMESTER – III											
23CAP301	Machine Learning with Python	I-III	a,b,c,e,f	4	-	-	4	40	60	100	68
23CAP302	.Net Programming	I-III	a,c,d,e	4	-	-	4	40	60	100	70
23CAP303	Cyber Forensics and Security	II	a,b,d	4	-	-	3	40	60	100	72
23CAP304	Elective III*	I-IV	b,c,e,l	4	-	-	4	40	60	100	74
23CAP305	Elective IV*	I-III	a,c,d,e,f	4	-	-	4	40	60	100	86
23CAP311	Machine Learning with Python -Practical	I-III	a,b,c,e	-	-	4	2	40	60	100	98
23CAP312	.Net Programming - Practical	I-III	a,b,c,d,e	-	-	4	2	40	60	100	100
23CAP313	Elective III-Practical*	I-III	a,b,c,d,e	-	-	3	2	40	60	100	102
	Journal Paper Analysis & Presentation	-	-	1	-	-	-	-	-	-	-
23XXPOE301	Open Elective*	-	-	3	-	-	2	40	60	100	112
23CAP391	Internship [#]	-	-	-	-	-	2	100	-	100	143
Semester Total		-	-	24	-	11	29	460	540	1000	
SEMESTER – IV											
23CAP491	Project and Viva Voce	-	-	-	-	-	14	80	120	200	144
Semester Total		-	-	-	-	-	14	80	120	200	-
Program Total		-	-	68	0	37	91	1180	1620	2800	-

[#]Internship :15 days are allotted at the end of the second semester.

Electives	Specialization	Course	
		Theory	Practical
I&II Sem 2	Database	23CAP204D - Database Administration	23CAP213D-Database Administration – Practical
	Network	23CAP204N - Cryptography and Network Security	23CAP213N - Network Security - Practical
	Software Engineering	23CAP204S – Software Testing and Quality Assurance	23CAP213S - Software Testing and Quality Assurance –Practical
	Web Designing	23CAP204W-Angular JS	23CAP213W – Angular JS – Practical
	Data Science	23CAP204DS – Foundations of Data Science	23CAP213DS – Foundations of Data Science - Practical
	Database	23CAP205D - Distributed Database Management System	
	Network	23CAP205N - TCP/IP	
	Software Engineering	23CAP205S - Object Oriented Analysis and Design with UML	
	Web Designing	23CAP205W - Semantic Web and Ontologies	
	Data Science	23CAP205DS – Natural Language Processing	
III& IV Sem 3	Database	23CAP304D- Data Mining and Data Warehousing	23CAP313D-Data Mining and Data Warehousing -Practical
	Network	23CAP304N – Software Defined Network	23CAP313N – Software Defined Network Practical using NS3
	Software Engineering	23CAP304S - Software Project Management	23CAP313S-Software Development - Practical Using Moodle
	Web Designing	23CAP304W – Web Design using WordPress	23CAP313W- Web Design using WordPress -Practical
	Data Science	23CAP304DS – Data Preprocessing and Visualization	23CAP313DS – Data Visualization - Practical
	Database	23CAP305D - Big Data Analytics	
	Network	23CAP305N - Wireless Sensor Networks	
	Software Engineering	23CAP305S - Software Metrics	
	Web Designing	23CAP305W - Internet of Things	
	Data Science	23CAP305DS – Deep Learning	

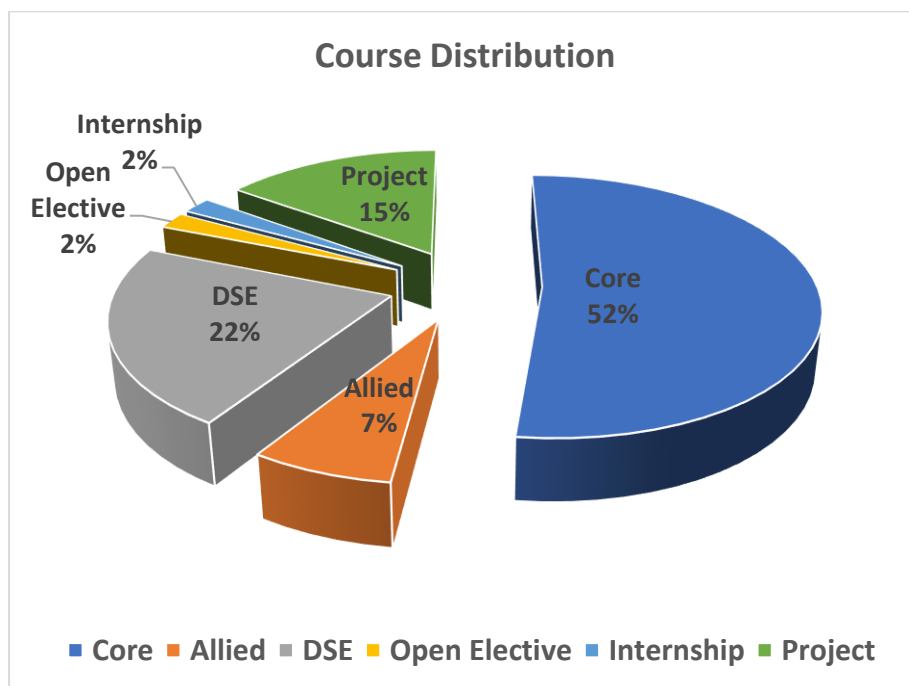
Specialization:
D -Database
N -Network
W -Web Designing
S -Software Engineering
DS - Data Science

***List of Open Elective Courses**

Sl.No	Name of the Offering Department	Course Code	Course Name
1.	Management	23MBAPOE301	Organisational Behaviour
2.	Physics	23PHPOE301	Material Characterization
		23PHPOE302	Numerical Methods and Programming
3.	Computer Applications	23CAPOE301	Robotics Process Automation
4.	Biochemistry	23BCPOE301	Nutrition and Dietetics
5.	Computer Science	23CSPOE301	Cyber Forensics
6.	Commerce	23CMPOE301	Personal Finance and Planning
7.	Chemistry	23CHEOE301	Chemistry in Everyday Life
8.	Microbiology	23MBPOE301	Fermentation Technology
9.	English	23EGPOE301	English for Competitive Examinations
10.	Biotechnology	23BTPOE301	Sericulture
11.	M.Sc Mathematics	23MMPOE301	Coding Theory

Course Distribution

Papers	Theory	Practical	Total
Core	33	14	47
Allied	6	-	6
DSE	16	4	20
Open Elective	2	-	2
Internship	-	2	2
Project	-	14	14
Total	57	34	91



SEMESTER-I
PHP5/MYSQL
(THEORY)

4H-4C

Instruction Hours/week: L:4 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To get hands-on experience in scripting, debugging, testing.
- To establish a working environment for PHP web page development
- To learn to create dynamic interactive pages with PHP.
- To learn to manipulate files with PHP.
- To learn to use SQL to output reports with MySQL

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Apply regular expressions in PHP programming including modifiers, operators, and metacharacters	Apply
CO2	Create PHP programs that use various PHP library functions, and that manipulate files and directories	Create
CO3	Analyze and solve various database tasks using the PHP language	Analyze
CO4	Create server-side web applications using PHP and MySQL	Create
CO5	Develop the files and directories management operation	Develop

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2			S									
CO3			S	L					M			
CO4			S									
CO5	L		S									

S-Strong; M-Medium; L-Low

UNIT I - Basics of PHP**9 HOURS**

Introduction to PHP – A brief history of PHP – language basics– lexical structure – data types – variables – expressions and operators – flow control statements-including code – embedding PHP in web pages - Working with Forms and Form Data - Building forms - Detecting form submissions - Single-page form processing - Validating form values - Problems with validation logic - Displaying validation errors - Custom validation functions - Single-page form with validations

UNIT II- Testing and Debugging**9 HOURS**

Basic error types; Debugging PHP Script: Errors in PHP -Preventing the display of private information-Form Validation: Using the Exit statement-string validation and regular expressions - Configuring PHP for error handling - Try/Catch-New in PHP5.Development planning: Formal software Development processes–optimizing your code-Using Coding standard; Functions in PHP-Recursion.

UNIT III- Files and Directories**10 HOURS**

Files and Directory Handling-Random Access File-Ownership and permissions; Splitting the Name and path from a file- Operations on files - Working with Directories: other Directory Functions–Traversing a directory hierarchy-creating a directory navigator-Building a Text Editor-Uploading Files.

UNIT IV - MySQL an Overview**10 HOURS**

Introduction – connecting to and disconnecting from the server – Entering queries –Creating and using a database – Creating and selecting a database – creating a table– loading data into a table – Retrieving information from a table – selecting all data –selecting particular rows – selecting particular columns – sorting rows – date calculations – working with NULL values – pattern matching – counting rows – using more than one tables.

UNIT V - MySQL Databases in PHP**10 HOURS**

Introduction – connecting to a MySQL database – querying the database – Retrieving and displaying the results – modifying data – deleting data. Designing simple applications.

SUGGESTED BOOKS

1. Doug Bierer , 2021. PHP 8 Programming Tips, Tricks and Best Practices: A practical guide to PHP 8 features, usage changes, and advanced programming techniques, 1st edition, Packt Publishing.
2. Robin Nixon, 2015. Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5, 4th edition, Shroff Publishers
3. Alan Forbes,2012.The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and Mysql,6th edition, Beak Check LLC.
4. Luke Welling , 2016. PHP and MySQL Web Development (Developer's Library),5th edition Addison-Wesley.
5. Steven Holzner, 2017. PHP: The Complete Reference, Raunak php study edition, McGraw Hill Education
6. Frank M. Kromann. 2018. Beginning PHP and MySQL: From Novice To Professional, Apress.

WEB LINKS:

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

SEMESTER-I
COMPUTER NETWORKS
(THEORY)

4H-4C

Instruction Hours/week: L:4 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To become familiar with layered communication architectures (OSI and TCP/IP).
- To understand the client/server model and key application layer protocols.
- To learn sockets programming and how to implement client/server programs.
- To understand the concepts of reliable data transfer
- To learn the principles of routing and the semantics and syntax of IP.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Identify the components required to build different types of networks and have an understanding of network models.	Understand
CO2	Illustrate the various error and flow control mechanisms and protocols of data link layer	Apply
CO3	Apply various routing protocols, demonstrate the best routing between nodes and describe the network functionalities for a given application.	Apply
CO4	Identify the protocols involved at the various layers and demonstrate the role of each protocol.	Apply
CO5	Analyze and describe the working principles of Internet.	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M										
CO2			S				S					
CO3		M						M				
CO4			S									
CO5		M	L									L

S-Strong; M-Medium; L-Low

UNIT I – Introduction**9 HOURS**

Uses of computer networks - Network hardware - Network software - Reference models - Example networks: RFID and Sensor Networks - Physical Layer: Theoretical basis for data communication - Guided transmission media: Twisted pairs - Coaxial cable - Fiber Optics - Unguided transmission: The Electromagnetic spectrum - Radio wave transmission- Micro wave transmission - Infrared transmission.

UNIT II- Data Link Layer**9 HOURS**

Design issues: Services provided to the network layer - Framing - Flow Control - Error Control - Error detection and correction - Elementary data link protocols: A Simplex Stop-and-Wait protocol - Sliding window protocols: A One-Bit Sliding window Protocol - MAC Layer: Channel allocation problem - Multiple access protocols: ALOHA - CSMA.

UNIT III- Network Layer**10 HOURS**

Design issues: Services provided to the Transport Layer - Routing algorithms: Shortest Path events - Distance Vector Routing - Link State Routing - Congestion control algorithms: Traffic aware routing - Admission Control - Internetworking: Tunneling - Internetwork Routing - Packet Fragmentation.

UNIT IV – Transport Layer**10 HOURS**

Transport service: Services provided to upper layer - Transport Service primitives - Elements of transport protocols: Addressing - Connection Establishment and Release - Error Control and Flow Control - Multiplexing – The internet transport protocols: UDP – RPC - TCP: Service Model - Connection Establishment and Release.

UNIT V - Application Layer**10 HOURS**

Domain Name System: The DNS Name Space - Resource Records - Name Servers - Electronic mail: Architecture and Services - The User Agents - Message Formats - Message Transfer and Delivery - World Wide Web: Architectural overview - Static and Dynamic Web Pages - HTTP - Mobile Web - Web Search.

SUGGESTED BOOKS

1. Andrew S. Tanenbaum, David J Wetherall, Nick Feamster, “Computer Networks”, 6th Edition, Pearson Education., New Delhi, 2022.
2. Forouzan Behrouz A., “Data Communication and Networking”, 5th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2018.
3. William Stallings, "Data and Computer Communication", Pearson Education, 10th Edition, 2018

WEB LINKS:

1. www.cs.vu.nl/~ast/CN5/
2. www.geeksforgeeks.org › computer-network-tutorials
3. www.tutorialspoint.com › data_communication_computer_network
4. www.computernetworkingnotes.com › networking-tutorials

NPTEL

1. <https://nptel.ac.in/courses/106/105/106105183/>
2. <https://nptel.ac.in/courses/106105081/>

SEMESTER-I
DESIGN AND ANALYSIS OF ALGORITHMS
(THEORY)

4H-4C

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

End Semester Exam:3 Hours

Course Objectives

- To understand the linear and non-linear data structures available in solving problems
- To understand the concept of algorithms
- To know the basic mathematical functions
- To know about the sorting and searching techniques and its efficiencies
- To get a clear idea about the various algorithm design techniques

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Analyze its time complexity	Analyze
CO2	Develop any new application with the help of algorithms techniques	Apply
CO3	Apply the algorithm design techniques to any of the real-world problem	Apply
CO4	Design own data structure according to the application need	Create
CO5	Apply the data structure to suit any given problem	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L							M			
CO2								S				
CO3		M										
CO4			S						L			
CO5		M	L									L

S-Strong; M-Medium; L-Low

UNIT I – Introduction**9 HOURS**

Introduction - Notion of Algorithm - Fundamentals of algorithmic problem solving - Important problem types - Fundamentals of the analysis of algorithm efficiency - analysis frame work - Asymptotic notations - Mathematical analysis for recursive and non-recursive algorithms.

UNIT II - Divide and Conquer Method and Greedy Method**9 HOURS**

Divide and conquer methodology - Merge sort - Quick sort - Binary search - Binary tree traversal - Multiplication of large integers - Strassen's matrix multiplication – Greedy method-Prim's algorithm - Kruskal's algorithm - Dijkstra's algorithm.

UNIT III - Dynamic Programming**10 HOURS**

Computing a binomial coefficient - Warshall's and Floyd's algorithm - Optimal binary searchtree - Knapsack problem - Memory functions.

UNIT IV - Backtracking and Branch and Bound**10 HOURS**

Backtracking - N-Queens problem - Hamiltonian circuit problem - Subset sum problem - Branch and bound - Assignment problem - Knapsack problem Traveling salesman problem.

UNIT V - Np- Hard and Np-Complete Problems**10 HOURS**

P & NP problems - NP-complete problems - Approximation algorithms for NP-hard problems - Traveling salesman problem - Knapsack problem.

SUGGESTED BOOKS

1. S. Sridhar, 2014. "Design and Analysis of Algorithms", 1st edition, Oxford University Press.
2. Robert Sedgewick, Kevin Wayne, 2011. "Algorithm" 4th edition, Addison-Wesley Professional.
3. Thomas H.Cormen, Charles E.Leiserson, Ronald L.Rivest, 2009. "Introduction to Algorithms", 3rd edition, PrenticeHall.
4. Anany Levitin, 2003. "Introduction to the Design and Analysis of Algorithms", Pearson Education.

WEB LINKS:

1. <https://www.gatevidyalay.com/algorithms/>
2. http://www.vssut.ac.in/lecture_notes/lecture1428551222
3. <https://lecturenotes.in/notes/17784-note-for-design-and-analysis-of-algorithm-daa-by-shekharesh-barik>
4. <https://aunotes.in/t/cs8451-design-and-analysis-of-algorithms-notes/939>
5. <https://www2.cs.duke.edu/courses/fall08/cps230/Book>

NPTEL

1. <https://nptel.ac.in/courses/106/105/106105184/>

SEMESTER-I
STATISTICAL COMPUTING
(THEORY)

4H-3C

Instruction Hours/week: L:4 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To explain the hypothesis of statistical testing, theory of estimation
- To explain Statistical Quality Control methodologies
- To know about Correlation and Regression
- To know about statistical quality control
- To compute the statistical process

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Perform basic statistical analyses using SAS and R and interpret the output	Analyze
CO2	Find information about Tools	Apply
CO3	Perform advanced statistical analyses using SAS and R, and then undertake such analyses	Apply
CO4	Apply the concepts of modeling in R and SAS such as linear modelling or GLM	Apply
CO5	Estimate the statistics regarding the progress	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L										L
CO2								M				
CO3		M							L			
CO4			S									
CO5		M	L									L

S-Strong; M-Medium; L-Low

UNIT I – Introduction to Statistics**9 HOURS**

Statistical Measures: Introduction to descriptive Statistics-basic definitions, frequency distribution, Measure of Central Tendency: Mean Median and Mode. Measure of Dispersion: Absolute and relative measure of dispersion: Range, Mean deviation, Quartile deviation, Standard deviation and corresponding relative measures.

UNIT II – Correlation and Regression**9 HOURS**

Correlation and Regression: Types of Correlation – Simple and Multiple, Positive and Negative, Linear and Non-Linear, Partial and Total. Methods of calculating correlation coefficient: Scatter diagram, Karl Pearson and Spearman (Rank) correlation coefficient, Regression: Types, lines and equations, Linear Regression - least square method of solving regression equations, X on Y and Y on X.

UNIT III – Hypothesis**10 HOURS**

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

UNIT IV – Estimations**10 HOURS**

Estimation and Design of Experiment: Point Estimation - characteristics of estimation - interval estimation -interval estimates of mean, standard deviation and proportion. Design of Experiments: Completely Randomized Design (CRD), Randomized Block Design (RBD) and Latin Square design (LSD) Models

UNIT V – SQC**10 HOURS**

Statistical Quality Control (SQC): Statistical basis for control charts, control limits. Control chart R charts. Charts for defectives – p and np charts. Chart for defects – C chart for variable – X, Acceptance Sampling – Single and Double sampling plans.

SUGGESTED BOOKS

1. T.Veerarajan, 2017. “Fundamentals of Mathematical Statistics”, Yesdee Publishing Pvt Ltd.
2. T N Srivastava and Shailaja Rego., 2012. “Statistics for Management”, McGraw Hill Education, New Delhi.
3. Steven K Thompson., 2012. “Sampling”, John Wiley and Sons inc.
4. Montgomery Douglas C., 2008. “Introduction to Quality Control”, Sixth Edition, John Wileyand Sons.
5. R.S.N.Pillai, Bagavathy, 2002. “Statistics”, S. Chand & Company Ltd, New Delhi.

WEB LINKS:

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

NPTEL

1. <https://nptel.ac.in/courses/111105041/>
2. <https://nptel.ac.in/courses/111105077/>
3. <https://nptel.ac.in/courses/111104120/>
4. <https://nptel.ac.in/resources/statistics/>

SEMESTER-I
ORGANIZATIONAL BEHAVIOUR
(THEORY)

4H-3C

Instruction Hours/week: L:4 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- 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 understand 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.
- To realize the importance of groups and teamwork and managing of conflict between the members of the organization

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Analyze organizational behavior issues in the context of the organizational behavior theories and concepts	Analyze
CO2	Assess the behavior of the individuals and groups in organization and manage the stress	Apply
CO3	Explain how organizational change and culture affect the working relationship within organizations	Apply
CO4	Understand and exhibit the communication skills to convey the thoughts and ideas of case analysis to the individuals and group.	Apply
CO5	Understand the application of OB using appropriate concepts, logic and theoretical conventions	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L										
CO2						M						
CO3		M					L					
CO4			S									
CO5		M	L					S				L

S-Strong; M-Medium; L-Low

UNIT I - Organization Behaviour: Introduction**9 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, Personality and Learning Theories**9 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. Values – Importance - Types of Values – Linking Individual personality and values to the work place.

UNIT III - Perception and Communication**10 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. Communication – Process – Directions of communication – interpersonal and organizational communication – Barriers to effective communication – Leadership - Styles – Theories.

UNIT IV - Group, Team, Power politics and Conflict**10 HOURS**

Foundation of Group Behavior - Concept of Group - Types of Groups - Stages of Group Development - Group Norms - Group Cohesiveness – Group Decision making – Understanding working teams – types of teams- creating effective teams- Turning individuals to team players. Power and Politics - Bases of Power – Power tactics. Conflict – Meaning –Transition in conflict thoughts- Conflict Process- Negotiation.

UNIT V - Organization Culture, Change and Stress Management**10 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. Stress – Causes of stress – Effects of Occupational Stress- Coping Strategies for Stress.

SUGGESTED BOOKS

1. Fred Luthans, 2017. Organizational Behavior: An Evidence - Based Approach, 12th edition, Mcgraw Hill Education, New Delhi.
2. Steven Mcshane and Mary Ann VonGlinow, 2017. Organizational Behavior, 6th edition, McGraw Hill Education, New Delhi
3. Robbins, S. P., and Judge, T.A., 2016. Organizational Behaviour.(16th edition).New Delhi: Prentice Hall of India.
4. Laurie J. Mullins, 2016. Management and Organizational behavior, 10th edition, Pearson Education, New Delhi

5. Robbins, S. P., and Judge, T.A., 2016. Essentials of Organizational Behavior. 13th edition, Pearson Education.

NPTEL

1. <https://nptel.ac.in/courses/110/105/110105033/>

SEMESTER-I
PHP5/MYSQL-PRACTICAL
(PRACTICAL)

5H-2C

Instruction Hours/week: L:0 T:0 P:5

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To get hands-on experience in scripting, debugging, testing.
- To establish a working environment for PHP web page development
- To learn to create dynamic interactive pages with PHP.
- To learn to manipulate files with PHP.
- To learn to use SQL to output reports with MySQL

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Implement regular expressions in PHP programming including modifiers, operators, and metacharacters	Implement
CO2	Create PHP programs that use various PHP library functions, and that manipulate files and directories	Create
CO3	Analyze and solve various database tasks using the PHP language	Analyze
CO4	Create server-side web applications using PHP and MySQL	Create
CO5	Develop the files and directories management operation	Develop

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S							M				
CO2			S									
CO3			S	L								
CO4			S									L
CO5	L		S							M		

S-Strong; M-Medium; L-Low

List of Programs:**60 HOURS**

1. Design an online loan application form.
2. Design a form to submit your resume in net.
3. Design an application for Library Management System
4. Design form for online reservation in air ways.
5. Design form for online shopping
6. Design an application for creating an online Advertisement.
7. Design an application for student Information System.
8. Design an application to display cookies information.
9. Write a program for display environment variables in MySQL.
10. Write a program to count web page hits.
11. Design an email form that validates the inputs, produces errors when inputs are typed incorrectly, and send an email to you when submitted.
12. Design an application to upload multiple files

SUGGESTED BOOKS

1. Doug Bierer , 2021. PHP 8 Programming Tips, Tricks and Best Practices: A practical guide to PHP 8 features, usage changes, and advanced programming techniques, 1st edition, Packt Publishing.
2. Robin Nixon, 2015. Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5, 4th edition, Shroff Publishers
3. Alan Forbes, 2012. The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and Mysql, 6th edition, Beak Check LLC.
4. Luke Welling , 2016. PHP and MySQL Web Development (Developer's Library), 5th edition Addison-Wesley.
5. Steven Holzner, 2017. PHP: The Complete Reference, Raunak php study edition, McGraw Hill Education
6. Frank M. Kromann. 2018. Beginning Php and MySQL: From Novice To Professional, Apress

WEB LINKS:

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

SEMESTER-I
COMPUTER NETWORKS -PRACTICAL
(PRACTICAL)

4H-2C

Instruction Hours/week: L:0 T:0 P:4

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To become familiar with layered communication architectures (OSI and TCP/IP).
- To understand the client/server model and key application layer protocols.
- To learn sockets programming and how to implement client/server programs.
- To understand the concepts of reliable data transfer
- To learn the principles of routing and the semantics and syntax of IP.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Identify the components required to build different types of networks and have an understanding of network models.	Understand
CO2	Illustrate the various error and flow control mechanisms and protocols of data link layer	Apply
CO3	Apply various routing protocols, demonstrate the best routing between nodes and describe the network functionalities for a given application.	Apply
CO4	Identify the protocols involved at the various layers and demonstrate the role of each protocol.	Apply
CO5	Analyze and describe the working principles of Internet.	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M									L	
CO2			S					M				
CO3		M										
CO4			S							S		
CO5		M	L									L

S-Strong; M-Medium; L-Low

List of Programs**48 HOURS**

1. Write a networking program in Java to implement a TCP server that provides services for a TCP Client.
2. Write a networking program to implement socket programming using User datagram Protocol in Java.
3. Implement an FTP server using socket programming.
4. Implement a chat server using socket programming.
5. Implement an ECHO server using socket programming.
6. Implement Address Resolution Protocol using socket programming.
7. Implement Ping server and Ping client using socket programming.
8. Using UDP to transfer a text file from one host to another.
9. Implement Remote Command Execution using network programming.
10. Simulate simple Web Browser.
11. Write a Java program to check whether the given DNS is found in the internet or not.
12. Write a network program using HTTP to print the document for the given URL.

SUGGESTED BOOKS

1. B. Forouzan, Debdeep Mukhopadhyay, 2015. Cryptography and Network Security, TMH
2. Stallings. W, 2007. Computer Communication Networks, 4th edition, Prentice Hall of India.
3. Tenenbaum. A.S, 2003. Computer Networks, 4th edition, Prentice Hall of India.

WEB LINKS:

1. www.cs.vu.nl/~ast/CN5/
2. www.geeksforgeeks.org › computer-network-tutorials
3. www.tutorialspoint.com › data_communication_computer_network

SEMESTER-I
DESIGN AND ANALYSIS OF ALGORITHMS-PRACTICAL
(PRACTICAL) 4H-2C

Instruction Hours/week: L:0 T:0 P:4

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To understand the linear and non-linear data structures available in solving problems
- To understand the concept of algorithms
- To know the basic mathematical functions
- To know about the sorting and searching techniques and its efficiencies
- To get a clear idea about the various algorithm design techniques

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Describe the divide and Conquer technique	Analyze
CO2	Interpret C programming language to solve mathematical problems	Apply
CO3	Design an algorithmic solution to tree and graph	Create
CO4	Build the interactive programs for backtracking problems	Apply
CO5	Understand the high-performance programs designed an algorithm to build up the real proficiency	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L										
CO2								L				
CO3		M										
CO4			S						L			
CO5		M	L									L

S-Strong; M-Medium; L-Low

List of Programs:**48 HOURS**

1. Sort a given set of elements using the Quick sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted. The elements can be read from a file or can be generated using the random number generator.
2. Implement a Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted. The elements can be read from a file or can be generated using the random number generator.
3. A) Obtain the Topological ordering of vertices in a given digraph.
B) Compute the transitive closure of a given directed graph using Warshall's algorithm.
4. Implement 0/1 Knapsack problem using Dynamic Programming.
5. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm
6. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.
7. A) Print all the nodes reachable from a given starting node in a digraph using BFS method.
B) Check whether a given graph is connected or not using DFS method.
8. Find a subset of a given set $S = \{s_1, s_2, \dots, s_N\}$ of n positive integers whose sum is equal to a given positive integer d. For example, if $S = \{1, 2, 5, 6, 8\}$ and $d = 9$ there are two solutions $\{1, 2, 6\}$ and $\{1, 8\}$. A suitable message is to be displayed if the given problem instance doesn't have a solution.
9. Implement any scheme to find the optimal solution for the Traveling Salesperson problem and then solve the same problem instance using any approximation algorithm and determine the error in the approximation.
10. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.
11. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.
12. Implement N Queen's problem using Back Tracking.

SUGGESTED BOOKS

1. S. Sridhar, 2014. "Design and Analysis of Algorithms", 1st edition, Oxford University Press.

WEB LINKS:

1. <https://lecturenotes.in/practicals/13551-lab-manual-for-design-and-analysis-of-algorithms-daa-by-nihar-ranjan-rout>
2. https://iare.ac.in/sites/default/files/lab1/II%20YEAR_DAA_LAB_MANUAL
3. <http://camelliait.ac.in/Lab%20Manual/ADA%20Lab%20Programs>

SEMESTER-II

J2EE

(THEORY)

4H-4C

Instruction Hours/week: L:4 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To learn J2EE as an architecture and platform for building and deploy web-based, n-tier, transactional, component-based enterprise applications.
- To develop the different types of applications, such as JDBC (Java Database Connectivity) used for making connection between the java programs and database.
- To learn JSP and servlets to create the dynamic web page, RMI (Remote Method Invocation) to create the remote objects.
- To know the JavaBean for creating and developing various applications.
- To understand the functioning of JSP.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Characterize the concepts J2SE and J2EE.	Understand
CO2	Develop Enterprise Applications using Session Bean, Entity Bean and MDB.	Apply
CO3	Java Servlets are used in embedded systems, wireless communication, and any other generic request/response application.	Understand
CO4	The EJB specification creates an infrastructure that takes care of the system-level programming.	Apply
CO5	A Java Bean is a reusable software component that can be visually manipulated in builder tools.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	M	S								
CO2	M	L	L	L							L	
CO3	M	M	M	M								M
CO4	M	L	L	M					L			
CO5	M	S	S	M								

S-Strong; M-Medium; L-Low

UNIT I – J2EE Overview**8 HOURS**

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

J2EE Containers: J2EE Container Services-J2EE Container Types-Packaging

UNIT II - J2EE Database Concepts**8 HOURS**

J2EE Database Concepts: Data – Database – Database Schema. JDBC Objects: Driver Types – Packages – JDBC Process – Database Connection – Database Connections for Enterprise Beans Statement Objects – Result Set – Meta Data.

UNIT III - Java Servlets**8 HOURS**

Overview of Servlet technology - Handling HTTP GET and POST requests – Session tracking **RMI:** Defining, implementing the RMI – Define the Client – Compile Execute the server and the client.

Networking: BOOKS a file on a web server – Establishing a simple server and a simple client (using stream sockets) – Random and Bit-Set Class – Class arrays – Interface Collection and Class Collections – Sets – Maps.

UNIT IV – Enterprise Java Beans**8 HOURS**

Enterprise Java Beans – Deployment Descriptors – Session Java Bean –Entity Java Bean – Message Driven Bean- Enterprise Beans- Sessions Beans- Entity Beans

UNIT V – Java Server Pages**8 HOURS**

Overview of JSP, Relation of Applets and Servlets with JSP, Scripting Elements, JSP Expressions, JSP Scriptlets, JSP Declarations, Predefined Variables, Creating Custom JSP Tag Libraries using Nested Tags.

SUGGESTED BOOKS

1. Jim Keogh, 2017. The Complete Reference J2EE, 1st Edition, Tata Mc Graw Hill Edition, New Delhi.
2. Tarun Singh, 2016. Java/J2EE, PHP, JSF, JSP, Servlet, Spring 4.0, Spring Boot 1.5,Hibernate 5.0, Bootstrap, HTML5, CSS3 and XML.
3. The Complete Reference, Eleventh Edition (PROGRAMMING & WEB DEV - OMG) Paperback – 19 March 2019. by Herbert Schildt (Author).
4. Paul J Perrone, Venkata S R RChaganti, S.R.Venkata Krishna, R Chaganti and TomSchwenk, 2003. J2EE Developer's Handbook, Sams Publications.
5. Joseph J Bambaraetal, 2001. J2EE Unleashed, 1st Edition, Tech Media.

WEB LINKS:

1. <http://www.codejava.net/java-se/jdbc/connect-to-oracle-database-via-jdbc>
2. <http://mrbool.com/how-to-create-rmi-client-and-server-to-invoke-remove-method-of-rmi-server-in-java/28320>

3. <https://freevideolectures.com/course/3616/java-j2ee-and-soa>
4. <https://www.javatpoint.com/java-programs>
5. <https://www.tutorialspoint.com/java/index.htm>
6. http://www.dsc.ufcg.edu.br/~jacques/cursos/j2ee/recursos/j2ee-1_3-doc-tutorial-draft5.pdf

NPTEL

1. <https://nptel.ac.in/courses/106/105/106105191/>
2. <https://www.nptelvideos.com/java/>

SEMESTER-II
MOBILE COMPUTING
(THEORY)

4H-3C

Instruction Hours/week: L:4 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

Enable the student

- 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
- To know the techniques involved in Vehicular Adhoc Networks.
- To examine the characteristics, techniques and technology of 1G,2G,3G and 4G

Course Outcomes (COs)

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

COs	Course Outcomes	Blooms Level
CO1	Analyze the architecture, merits and demerits of Wireless technologies like Infra-Red, blue tooth, Wi-Fi, RFID and Wi-Max .	Apply
CO2	Characterize the principles of mobile technologies like GPRS, GSM, CDMA, and TDMA	Apply
CO3	Compare the characteristics and techniques MANET with VANET	Analyze & Apply
CO4	Analyze technology of 1G,2G,3G and 4G for gaining the working knowledge of fourgeneration wireless technologies.	Apply
CO5	Apply the features of Android programming for developing Android Applications	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	M	M								
CO2	S	M	S	M				M	M			
CO3	M	M	S	M								
CO4	M	M	M	M					S			
CO5	M	M	L	S				M	M			

S-Strong; M-Medium; L-Low

UNIT I – Mobile Computing -Introduction**8 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-**Overview of Mobile IP – Features of Mobile IP-Real Time Applications.**

UNIT II – Mobile Telecommunication System**8 HOURS**

Global System for Mobile Communications – GSM Architecture – GPRS – GPRS Network Architecture - – Generations of Cellular Networks - 3G Architecture- Architecture of 4G - **5G Architecture.** MOBILE Ad-Hoc Basic Concepts- Applications – Design Issues – **Types of MANET-** Vehicular Ad Hoc Networks (VANET) – MANET Vs VANET – Security of VANET and MANET

UNIT III – Edge Computing Introduction**8 HOURS**

IoT and Edge Computing Definition and Use Cases. Introduction to Edge Computing Scenario's and Use cases - Edge computing purpose and definition, Edge computing use cases, Edge computing hardware architectures, Edge platforms, Edge vs Fog Computing, Communication Models - Edge, Fog and M2M.

UNIT IV – RaspberryPi**8 HOURS**

Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout and Pinouts, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi, Connecting Raspberry Pi via SSH, Remote access tools, Interfacing DHT Sensor with Pi, Pi as Webserver, Pi Camera, Image & Video Processing using Pi.

UNIT V – Fog Computing**8 HOURS**

Introduction to Fog Computing: Characteristics-Application Scenarios, Issues and challenges-Fog Computing Architecture-, Fog-IoT architectural model-Software Defined Networking and application in Fog Computing.

SUGGESTED BOOKS

1. Asoke K. Talukder, Hasan Ahmed, Roopa R Yavagal, 2017. “Mobile Computing: Technology, applications, and service creation”, Tata McGraw Hill, New Delhi.
2. Charles E.Perkins, 2018. “Ad Hoc Networking”, Addison-Wesley Publications
3. IoT and Edge Computing for Architects - Second Edition, by Perry Lea, Publisher: Packt Publishing, 2020, ISBN: 9781839214806.
4. Raspberry Pi Cookbook, 3rd Edition, by Simon Monk, Publisher: O'Reilly Media, Inc., 2019, ISBN: 978149204322.
5. Fog and Edge Computing: Principles and Paradigms by Rajkumar Buyya, Satish Narayana Srirama, Wiley publication, 2019, ISBN: 9781119524984.
6. David Jensen, “Beginning Azure IoT Edge Computing: Extending the Cloud to the Intelligent Edge, MICROSOFT AZURE.

WEB LINKS:

1. en.wikipedia.org/wiki/Mobile_computing

2. www.cse.iitk.ac.in/users/rkg/Talks/mobile_main.pdf
3. [Edge Computing - GeeksforGeeks](#)
4. <https://www.geeksforgeeks.org/fog-computing>
5. www.tutorialspoint.com/android/
6. 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>

SEMESTER-II
ARTIFICIAL INTELLIGENCE
(THEORY)

4H-3C

Instruction Hours/week: L:4 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives:

- To define the problem-solving methods of Artificial Intelligence.
- To describe the various knowledge representation strategies in AI
- To demonstrate the knowledge inference methodologies of AI
- To examine the various Machine learning models and algorithms.
- To explain the role of expert systems in IT field

Course Outcomes:

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

COs	Course Outcomes	Blooms Level
CO1	Analyze the problem-solving strategies of AI and Apply the knowledge representation methods using Prolog or Visual Prolog	Analyze & Apply
CO2	Compare the knowledge inference methods of AI	Apply
CO3	Characterize the machine learning tasks and machine learning types	Understand
CO4	Apply the expert system methods for developing AI based expert systems	Apply
CO5	Know the architecture of Expert system	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	L	M	S							
CO2	M	M	L	S	M				M			
CO3	M	L	L	M	S							
CO4	L	S	M	S	M						L	
CO5	M	L	M	S	L							L

S-Strong; M-Medium; L-Low

UNIT I - Problem Solving and AI**8 HOURS**

Introduction to AI-Problem formulation, Problem Definition --Problem solving methods – Problem graphs, Matching, Indexing and Heuristic functions -Hill Climbing – Heuristic programming – state space representations – graph notations. Agents and Environments – concept of rationality – nature of environments – structure of agents. Problem solving agents – search algorithms – uninformed search strategies.

UNIT II - Representation of Knowledge**8 HOURS**

Game playing – Puzzles and Games- Knowledge representation using Predicate logic- Knowledge representation using other logic-Structured representation of knowledge- Introduction to predicate calculus - Use of predicate calculus- Features of Prolog and Visual Prolog Language. Constraint satisfaction problems – constraint propagation – backtracking search for CSP – local search for CSP – structure of CSP.

UNIT III - Knowledge Inference**8 HOURS**

Knowledge representation -Production based system, Frame based system. Inference – Backward chaining- Forward chaining - Rule based System-- Certainty factors-Bayesian Theory-Bayesian Networks -Dempster Shafer theory. – Fuzzy Logic-Fuzzy Sets-Fuzzy Inference-Applications of Fuzzy Logic.

UNIT IV - Planning and Machine Learning**8 HOURS**

Basic plan generation systems – Strips -Advanced plan generation systems – K strips - Strategic explanations - Machine learning- Machine Learning tasks- Types of machine learning algorithms – Machine Learning models.

UNIT V - Expert Systems**8 HOURS**

Architecture of expert systems- Roles of expert systems – Knowledge engineering: knowledge representation techniques – knowledge acquisition – acquiring knowledge from experts – automating knowledge acquisition –Building an expert system – difficulties in developing an expert system.

PROBABILISTIC REASONING: Acting under uncertainty – Bayesian inference – naïve Bayes models

SUGGESTED BOOKS

1. Kevin Night and Elaine Rich, Nair B., 2017. “Artificial Intelligence (SIE)”, Mc Graw Hill.
2. Flasiński, Mariusz. 2016. “Introduction to Artificial Intelligence”, Tata Mcgraw Hill, Delhi.
3. Chandra. S.S.V, 2014. “Artificial Intelligence and Machine Learning”, Kindle Edition.
4. Dr.R.P.Das, 2012, “Neural Networks and Fuzzy Logic”, 1stEdition, Tata Mcgraw Hill, Delhi
5. Dan W. Patterson, 2007. “Introduction to AI and ES”, Pearson Education.

6. Stuart Russell and Peter Norvig, “Artificial Intelligence – A Modern Approach”, Fourth Edition, Pearson Education, 2021.

WEB LINKS:

1. <https://www.tutorialspoint.com> › Artificial Intelligence
2. www-formal.stanford.edu/jmc/whatisai/node3.html
3. https://swayam.gov.in/nd1_noc19_me71/preview
4. https://swayam.gov.in/nd1_noc20_cs30/preview

SEMESTER-II
DATABASE ADMINISTRATION
(THEORY)

Instruction Hours/week: L:4 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To install and configure database
- To create users and assign roles
- To optimize schemas, tables, indexes and views
- To manage database services and clients
- To move the data from one database to another database.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Design, model and install any database management systems by using Oracle database as sample	Understand
CO2	Plan, design, construct, control and manage database instances, database network environment, storage structures, user security, database backup and recovery, database maintenance	Apply
CO3	Define and devise transaction management, concurrency control, crash recovery components	Understand
CO4	Examine and perform data base administration roles	Analyze
CO5	Examine the database operations by using Oracle database system as a sample	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M									
CO2	M	S	M	M	S				M			
CO3	S	M	S	M	S						M	
CO4	M	S	M							L		
CO5			M									

S-Strong; M-Medium; L-Low

UNIT I - Introduction to Oracle DBA**8 HOURS**

Oracle DBA's: The Oracle DBA's Role- Oracle Database 10g Architecture: Oracle Databases and instances- Oracle Logical Storage structures – Oracle Logical Database structures – Oracle Physical Storage structures- Multiplexing Database Files - Oracle Memory Structures-Oracle Backup and Recovery – Security Capabilities – Tablespace Architecture – Oracle Tablespace installation – Traditional Disk Space Storage – Automatic Storage Management.

UNIT II – Dealing with Database Corruption**8 HOURS**

Block Corruption Symptoms: ORA-1578-DBVERIFY Utility and the ANALYZE command-Initialization parameter DB_BLOCK_CHECKING-Segment Metadata Dump and Verification-Using Flashback for Logical Corruption and using DBMS_REPAIR-Block Media Recovery-RMAN BMR Interface-Dumping and Verifying Segment Metadata.

Monitoring and Managing Storage**8 HOURS**

Database Storage Structures-Space Management Overview-Oracle-Managed Files (OMF)-Row Chaining and Migrating-Proactive Tablespace Monitoring-Managing Resumable Space Allocation-SYSAUX Tablespace-Monitoring table and index space usage

UNIT III – Introduction to Tuning Application**8 HOURS**

Tuning Application Design – Tuning SQL – Tuning Memory Usage – Tuning Data Access – Tuning Data Manipulation – Tuning Physical Storage – Reducing Network Security – Database Authentication Methods.

UNIT IV – Authorization Methods**8 HOURS**

Database Authorization Methods – Auditing: Auditing Locations – Statement Auditing – Privilege Auditing Schema Object Auditing – Auditing Related Data Dictionary Views – Logical Backups – Physical Backups – Using Data Pump Export and Import – Data Pump Import Options – Integration of Backup Procedures.

Overview of Oracle Net – Using the Oracle Net Configuration Assistant – Using the Oracle Net Manager – Starting the Listener Server Process – Controlling the Listener Server Process Using Data links.

UNIT V - Creating Table Spaces in a VLDB Environment**8 HOURS**

Creating Tablespaces in a VLDB Environment: Big file Tablespace Basics – Creating and Modifying Big file Tablespace – Big file Tablespace ROWID format – DBMS_ROWID and Bigfile Tablespaces- Advanced Oracle Table Types – Using Bitmap Indexes – Oracle Data Pump Remote queries – Remote Data Manipulation: Two Phase Commit – Managing Distributed Data – Managing Distributed Transactions – Monitoring and Tuning Distributed Database.

SUGGESTED BOOKS

1. Amarnath Reddy, 2018. "Oracle DBA 11g/12c – Database Administration for junior DBA".
2. Saikat Basak, 2010. "Oracle DBA Concise Handbook", Ensel Software.

3. Bob Bryla, Kevin Loney, 2008. "Oracle Database 11g DBA Handbook", McGraw-Hill Osborne.

WEB LINKS:

1. www.oracle.com/technology/software/products/database/oracle10g/index.html
2. www.oracle-base.com/articles/10g/
3. www.adp-gmbh.ch/ora/misc/10g.html

NPTEL

1. <https://nptel.ac.in/courses/106105175/>
2. <https://nptel.ac.in/courses/106105175/>

SEMESTER-II
CRYPTOGRAPHY AND NETWORK SECURITY
(THEORY)

4H-4C

Instruction Hours/week: L:4 T:0 P:0 Marks: Internal:40 External:60 Total:100
End Semester Exam:3 Hours

Course Objectives

- To teach fundamental aspects of security in a modern networked environment with the focus on system design aspects and cryptography in the specific context of network.
- To build protection mechanisms in order to secure computer networks.
- To write coding to encrypt “Plain Text” into “Cipher Text” and vice versa, using different encryption algorithms.
- To build secure authentication systems by use of message authentication techniques.
- To know about the blockchain technology.

Course Outcomes (Cos)

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

COs	Course Outcomes	Blooms Level
CO1	Classify the symmetric encryption techniques and illustrate various public key cryptographic techniques	Understand
CO2	Evaluate the authentication and hash algorithms.	Apply
CO3	Summarize the intrusion detection and its solutions to overcome the attacks.	Understand
CO4	Demonstrate the basic concepts of system level security	Apply
CO5	Apply the block chain technology for security	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	M	S	M							
CO2	M	S	M	M	S				M		S	L
CO3	S	M	S	M	S							
CO4	M	S	M	L	M				M		M	
CO5	L	S	M	S	L							

S-Strong; M-Medium; L-Low

UNIT I- Introduction to Cryptography**8 HOURS**

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

UNIT II- Public Key Cryptosystem**8 HOURS**

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

UNIT III - Network Security Practice**8 HOURS**

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

UNIT IV-Web Security and Cryptographic Algorithms, Steganography 8 HOURS

Web Security – Secure Socket Layer – Secure Electronic Transaction; System Security – Intruders and Viruses – Firewalls – Password Security. **Case Study:** Network Forensic – Security Audit; Other Security Mechanism: Introduction to Stenography – Quantum Cryptography – Water Marking – DNA Cryptography.

Unit V – Basics of Blockchain Technology**8 HOURS**

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

SUGGESTED BOOKS

1. William Stallings, 2013. “Cryptography and Network Security”, 6th Edition. Pearson Education, New Delhi.
2. A. Menezes, P. Van Oorschot and Vanstone, 2010. “Hand Book of Applied Cryptography”, 2nd Edition. CRC Press, New Delhi.
3. Ankit Fadia, 2010. “Network Security”, 2nd Edition. McMillan India Ltd, New Delhi.
4. Bruce Schneier, 2006. “Applied Cryptography”, 2nd Edition. CRC Press, New Delhi.

WEB LINKS:

1. williamstallings.com/Crypto3e.html
2. u.cs.biu.ac.il/~herzbea/book.html
3. www.flipkart.com/search-books/cryptography+and+network+security+William+stallings+ebook

NPTEL

1. <https://nptel.ac.in/courses/106105162/>
2. https://swayam.gov.in/nd1_noc20_cs21/preview

SEMESTER-II
SOFTWARE TESTING AND QUALITY ASSURANCE
(THEORY)

4H-4C

Instruction Hours/week: L:4 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To perform test each time they are run, thereby eliminating human error.
- To test how the software reacts under repeated execution of the same operations.
- To program sophisticated tests which bring out hidden information from the application.
- To reuse tests on different versions of an application, even if the user interfaces changes.
- To know the risks in project management system

Course Outcomes (COs)

Upon completion of this course, students will be able to

COs	Course Outcomes	Blooms Level
CO1	Test the software by applying testing techniques to deliver a product free from bugs	Apply
CO2	Evaluate the web applications using bug tracking tools	Apply
CO3	Investigate the scenario and the able to select the proper testing technique	Analyze
CO4	Deliver quality product to the clients by way of applying standards such as TQM, Six Sigma	Apply
CO5	Evaluate the estimation of cost, schedule based on standard metrics	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	L	M	L							
CO2	L	M	S	M	M				S	M	L	
CO3	S	L	M	S	M							
CO4	M	S	M	L	S							
CO5	M	L	M	S	L							

S-Strong; M-Medium; L-Low

UNIT I – Introduction to Testing**8 HOURS**

Introduction: Purpose of Testing – Dichotomies - Model for Testing – consequences of bugs- Taxonomy for bugs

UNIT II – Flow Graphs and Path Testing**8 HOURS**

Flow/Graphs and Path Testing: Path testing basics-predicates, path predicates and Achievable paths – Path sensitizing– path instrumentation-implementation and application of path testing

UNIT III - Introduction to Flow Testing**8 HOURS**

Transaction flow testing: – Transaction flow - Transaction flow testing techniques – implementation comments – testability tips -Data flow testing basics-Data flow testing strategies.

UNIT IV – Domains and Paths**8 HOURS**

Domains and paths-Nice Domains and Ugly Domains-Domain Testing-Domains and interface testing-Domains and testability-Metrics-Linguistic metrics-structural metrics-Hybrid metrics- metrics implementations-Testability tips

UNIT V – Risk Analysis**8 HOURS**

Risk Analysis: Benefits of Risk analysis – Project Management Strategies and Risk – MITs riskAnalysis – MITs Ranking Criteria - Using Risk Ranking in Forensics –Test estimation process- MIT totals worksheet-Sizing worksheet

SUGGESTED BOOKS

1. Dorothy Graham,Rex Black, and et.al , 2011. “Foundations of Software Testing - ISTQBCertification”, 3rd Edition, Cengage Learning.
2. R.Rajani, and P.P.Oak, 2004. “Software Testing”, Tata Mcgraw Hill, New Delhi.
3. Boris Beizer, 2003. “Software Testing Techniques”, II Edition., Dream Tech India, NewDelhi. (UNIT – I, II, III, IV)
4. Marnie L Hutcheson, 2003. “Software testing fundamentals”, 1st Edison, Wiley, DreamTech India, New Delhi. (UNIT – V)
5. Burnstein, 2003. “Practical Software Testing”, Springer International Edison.

WEB LINKS:

1. <http://my.safaribooksonline.com>
2. <http://www2.sas.com>
3. <http://www.softwaretesting fundamentals.com>
4. www.cs.cmu.edu
5. www.softwaretesting management.con
6. <http://www.java2novice.com/junit-examples/test-list-objects/>

NPTEL

1. https://swayam.gov.in/ndl_noc19_cs71/preview
2. https://npTEL.ac.in/content/storage2/npTEL_data3/html/mhrd/ict/text/117106112

SEMESTER-II
ANGULAR JS
(THEORY)

4H-4C

Instruction Hours/week: L:4 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To utilize AngularJS formats adequately
- To make the perplexing structures quickly
- To confine web applications to take into account worldwide groups of onlookers
- To make Secured web application s from dangers and pernicious clients
- To understand the compiler for building better and more propelled orders

Course Outcomes (Cos)

Upon successful completion of this course, students will be able to:

COs	Course Outcomes	Blooms Level
CO1	To apply an AngularJS Single Page Application from scratch	Apply
CO2	To build an awesome User Interface, to create and bind controllers with JavaScript	Understand
CO3	To separate the model, view, and controller layers of your application and implement them using AngularJS	Apply
CO4	To integrate and enhance Angular applications with other useful JavaScript libraries such as Node.js	Analyze
CO5	Test the application using AngularJS	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S	M	S	S							
CO2	M	S			M					L		
CO3	S	M	L	M	S						M	
CO4			M	S	M				S			
CO5	M	S	M	S	M							

S-Strong; M-Medium; L-Low

UNIT I- Introducing Angular JS**8 HOURS**

Introduction to Angular JS- MVC Architecture- Conceptual Overview- Setting up the Environment- Starting Out with Angular JS. - First Application- Understanding ng-attributes. Number and String Expressions- Object Binding and Expressions- Working with Arrays- Forgiving Behavior- Understanding Data binding.

UNIT II- Directives and Controllers**8 HOURS**

Directives: Conditional Directives- Styles Directives- Mouse and Keyboard Events Directives **Understanding Controllers-** Programming Controllers& \$scope object- Adding Behavior to a Scope Object- Passing Parameters to the Methods- Having Array as members in Controller Scope. Nested Controllers and Scope Inheritance- Multiple Controllers and their scopes.

Unit III- Angular JS Filters and Forms**8 HOURS**

Filters: Built-In Filters- Uppercase and Lowercase Filters- Currency and Number Formatting Filters-order By Filters- Creating Custom Filters- **Using Simple Form-** Working with Select and Options- Input Validations-Using CSS classes- Form Events- Custom Model update triggers- Custom Validations- Error Handling with Forms- Other Form Controls.

Unit IV- Modules and Services in Angular JS**8 HOURS**

Why Module? –Module Loading and Dependencies- Recommended Setup of Application- Creation vs Retrieval. **Angular JS Services-** Understanding Services- Developing Creating Services- Using a Service- Injecting Dependencies in a Service. Introduction to SPA- Creating HTML Templates- Configuring Route Provider.

Unit V- Server Communications, Testing and Routing**8 HOURS**

Server Communication Using \$http: Fetching Data with \$http Using GET- Advanced \$http. **Unit Testing:** What and Why? -Introduction to Karma- Jasmine: Spec Style of Testing- Writing a Unit Test for Our Controller –Running the Unit Test.
Routing Using ng Route: Routing in a Single-Page Application- Using Route- Routing Options-Additional Configuration.

SUGGESTED BOOKS

1. Chandermani Arora, Kevin Hennessy, 2018. “Angular 6 by Example: Get up and running with Angular by building modern real-world web apps”, 3rd Edition, Kindle Edition.
2. Agus Kurniawan, 2014. “AngularJS Programming by Example”, First Edition
3. Adam Freeman, 2014. “Pro AngularJS “, First Edition, Apress.
4. Brad Green and Shyam Seshadri, 2013. “Angular JS”, First edition, O'Reilly Publications.

WEB LINKS:

1. <http://www.w3schools.com/angular/default.asp>
2. <http://www.tutorialspoint.com/angularjs/>
3. https://www.tutorialspoint.com/angularjs/angularjs_tutorial.pdf
4. <https://www.edx.org/course/angularjs-framework-fundamentals>

NPTEL

1. <https://nptel.ac.in/courses/106/106/106106147/>

SEMESTER-II
FOUNDATION OF DATA SCIENCE
(THEORY)

4H-4C

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

End Semester Exam: 3Hours

Course Objectives

- To study the basic concepts of Data Science and data lifecycle.
- To understand the theoretical and mathematical aspects of Data Science models.
- To learn common random variables and their uses, and with the use of empirical distributions.
- To obtain the knowledge in data management tools.
- To explore the major techniques for data science.

Course Outcomes (Cos)

Upon successful completion of this course, students will be able to:

COs	Course Outcomes	Blooms Level
CO1	Understand the key concepts in data science, including tools and approaches	Apply
CO2	Understand the concepts in data collection, sampling and probabilistic models	Understand
CO3	Understand the various techniques in data science	Apply
CO4	Apply the mathematical formulation of machine learning and statistical models to visualize the data in various methods.	Analyze
CO5	Apply a suitable data science technique to solve an information analytics problem	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S		S	L	M						
CO2	M			S		L					L	
CO3	S			M		L						
CO4	M	L			M	M				M	S	L
CO5	L	S			L	M						

S-Strong; M-Medium; L-Low

UNIT I- Introduction**8 HOURS**

The Big Picture: What is Data Science? –The data life cycle: pre-processing, analysis, post-processing–Preprocessing: Data gathering, cleansing, visualization, and understanding (Mean, Variance, Standard Deviation. Percentiles.)–Data Storage (Relational databases, e.g. MySQL)

UNIT II- Sampling**8 HOURS**

Sampling – Probability Models for Statistical Methods: Discrete and continuous probability distributions, density functions. Random variables, expected values, variance, correlation.

UNIT III- Data Normalization**8 HOURS**

Data Normalization (z-values, transforms) –Random processes –Data Management: Tools for Data Analysis, Case Study: Data analysis using Python-Arrays, Visualization.

UNIT IV- Major Techniques in Data Science**8 HOURS**

Major Techniques in Data Science: Data mining, Data warehousing, Data mining vs Data warehouse–Machine Learning-Supervised Learning, Unsupervised Learning.

UNIT V- Business Intelligence**8 HOURS**

Business Intelligence–Descriptive Analytics, Diagnostic Analytics, Predictive Analytics, Prescriptive Analytics–Cloud computing-definition, Cloud services, types of clouds, some of commercial and non-commercial cloud service providers.

SUGGESTED BOOKS

1. Saltz Jeffrey S, 2019. “An Introduction to Data Science”, Second Edition, Sage Publications Inc,
2. Peter Bruce & Andrew Bruce, 2017. “Practical Statistics for Data Scientists”, First Edition, O’Reilly Publication
3. Murtaza Haider, 2015. “Getting Started with Data Science: Making Sense of Data with Analytics”, IBM Press, First Edition
4. Glenn J. Myatt, Wayne P. Johnson, 2014. “Making Sense of Data I: A Practical Guide to Exploratory Data Analysis and Data Mining”, Second Edition, John Wiley & Son Publication,
5. Dawn Griffiths, 2008. “Head First Statistics”, First Edition, O’Reilly Publication.

WEB LINKS:

1. <https://www.inferentialthinking.com/chapters/intro>
2. <https://www.openintro.org/stat/>
3. https://swayam.gov.in/nd1_noc20_cs36/preview
4. https://swayam.gov.in/nd1_noc19_cs60/preview
5. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-0002-introduction-to-computational-thinking-and-data-science-fall-2016/>

SEMESTER-II
DISTRIBUTED DATABASE MANAGEMENT SYSTEM
(THEORY)

4H-4C

Instruction Hours/week: L:4 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

Course Objectives

- To design good performing distributed database schemas.
- To create optimized query execution plan.
- To efficiently distribute and manage the data.
- To manage distributed access control
- To know how to make secure the databases.

Course Outcomes (Cos)

Upon completion of this course, students will be able to

COs	Course Outcomes	Blooms Level
CO1	Analyze the physical structure of the database to handle data	Analyze
CO2	Apply the knowledge of design alternatives and fragmentation for data distribution	Understand
CO3	Demonstrate the concept of normalization of the database and characterize the concepts of deadlock handling in real time transactions of database	Apply
CO4	Apply the knowledge of database security for protecting data security	Apply
CO5	Handle the deadlock in the database operation	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S		S	L	M						
CO2	M	L	M	S	M	L						
CO3	S	M	S	M	S	L						
CO4	M	L	M	L	M	S						
CO5	L	S		S	L	M						

S-Strong; M-Medium; L-Low

UNIT I – Introduction to Database Concepts**8 HOURS**

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

UNIT II – Design Alternatives and Fragmentation**8 HOURS**

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

UNIT III - Query Optimization**8 HOURS**

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

UNIT IV - Deadlock Handling**8 HOURS**

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

UNIT V - DDBE Security**8 HOURS**

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

SUGGESTED BOOKS

1. Saeed K. Rahimi And Frank S. Haug, 2010. “Distributed Database Management Systems : A Practical Approach”, 1st Edition, A John Wiley & Sons, Inc., Publication.
2. Tamer OzusM, Patrick Valduriez, S. Sridhar, 2006. “Principle Of Distributed Database Systems”, 1st Edition, Pearson Education.
3. William M. Newman, Robert F. Sproull, 2004. “Principles of Interactive Computer Graphics”, 1st Edition, Pearson Education.

WEB LINKS:

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

NPTEL

1. <https://nptel.ac.in/courses/106105175/>
2. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/106104135/

SEMESTER-II

TCP/IP

(THEORY)

4H-4C

Instruction Hours/week: L:4 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

Course Objectives

- To learn about IPv4 forwarding and routing.
- To learn the Domain Name System (DNS).
- To learn about IPv6 addresses.
- To know the Architectural Overview of the TCP/IP Protocol Suite
- To know about the various protocols such as ARP & RARP

Course Outcomes (Cos)

Upon Completion of this course, student will be able to

COs	Course Outcomes	Blooms Level
CO1	Explain TCP/IP protocols, ports, sockets, and data encapsulation	Analyze
CO2	Demonstrate the process of packet fragmentation and reassembly	Apply
CO3	Explain the key features and functions of TCP and UDP	Analyze
CO4	Apply the knowledge of DNS queries, name resolution, zone data transfers and reverse DNS queries	Apply
CO5	Analyze the knowledge of TCP/IP routing for the working of routing protocols and find the difference between TCP and UDP	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S	M	S	M	L						
CO2	S	L	S	M	M	S				L	S	M
CO3	M	M	L	M	S	M						
CO4	S	L	M	L	S	S		M	L	S		
CO5	L	S	M	M	L	S						

S-Strong; M-Medium; L-Low

UNIT I – Introduction**8 HOURS**

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

UNIT II – ARP & RARP**8 HOURS**

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

UNIT III- Routing And Routed Protocols**8 HOURS**

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

UNIT IV - UDP Operation**8 HOURS**

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

UNIT V – Remote Login**8 HOURS**

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

SUGGESTED BOOKS

1. Behrouz A. Forouzan, 2010. “TCP/IP Protocol Suite, 4th Edition. New Delhi: Tata McGrawHill Publication.
2. Douglas E. Comer, 2000. “Internetworking With TCP/IP, Vol 1: Principles Protocols andArchitecture”, 4th Edition. New Delhi: Pearson Education.
3. William Stallings, 1997. “Data and Computer Communication”, 5th Edition. New Delhi:Prentice Hall of India.

WEB LINKS:

1. en.wikipedia.org/wiki/Internet_protocol_suite
2. [http://docwiki.cisco.com/wiki/Introduction to WAN Technologies](http://docwiki.cisco.com/wiki/Introduction_to_WAN_Technologies)
3. www.yale.edu/pclt/COMM/TCPIP.HTM
4. www.w3schools.com/tcpip/default.asp

NPTEL

1. <https://nptel.ac.in/courses/106105084/>
2. <https://nptel.ac.in/content/storage2/npteldata3/html/mhrd/ict/text/106105084/lec33>

SEMESTER-II
OBJECT ORIENTED ANALYSIS AND DESIGN WITH UML
(THEORY) 4H-4C

Instruction Hours/week: L:4 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

Course Objectives

- To use object-oriented technologies and Unified Modeling Language
- To perform object-oriented analysis and design
- To explain how the Unified Modeling Language (UML) represents an object-oriented system using a number of modeling views.
- To know about class diagrams
- To design the application using interaction diagram

Course Outcomes (Cos)

Upon Completion of this course, student will be able to

COs	Course Outcomes	Blooms Level
CO1	Understand of programming language concepts	Understand
CO2	Demonstrate the software engineering principles	Apply
CO3	Apply the principles of software engineering to software design; Apply the knowledge of OOAD to complete large software project	Apply
CO4	Analyze the deployment of UML diagrams for software design	Analyze
CO5	Apply the principles of software engineering quality principles for developing quality software	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	S	M	L	L						
CO2	S			S	L	L				M		
CO3	S	M	L	S	S	M					L	
CO4	M	L			M	L			S			
CO5	L	S	M	S	L	S						

S-Strong; M-Medium; L-Low

UNIT I - Structure of Complex Systems**8 HOURS**

Complexity: The structure of complex systems-the inherent complexity of software-The five attributes of a complex system-Organized and Disorganized Complexity-Bringing order to Chaos-on Designing complex systems. The Object model: The evolution of the object model- Foundations of the object model-Elements of the object model-Appling the object model, object oriented system development life cycle.

UNIT II – Introduction of Classes and Objects**8 HOURS**

Classes and Objects: The nature of an object-Relationship among objects-The nature of a class- Relationships among classes-The interplay of classes and objects-On building quality classes and objects.

UNIT III – Classification and Notation**8 HOURS**

Classification: The importance of proper classification-Identifying classes and objects-Key abstraction and mechanisms. Notation: The unified modeling language-Package diagrams-Component diagrams.

UNIT IV - Deployment Diagrams**8 HOURS**

Deployment diagrams-Use case diagrams-Activity Diagrams-Class Diagrams-Sequence Diagrams-Interaction overview diagrams-Composite structure diagrams -State machine diagrams-Timing Diagrams-Object diagrams-communication diagrams.

UNIT V - Process and Pragmatics**8 HOURS**

Process: First principles-The Macro Process: The software development lifestyle- The Micro Process: The analysis and design process. Pragmatics: Management and planning-Staffing- Release Management-Reuse-Quality assurance and metrics

CASE study and TOOLS

Railway domain: Platform assignment system for the trains in a railway station - Academic domain: Student Marks Analyzing System - ATM system - Stock maintenance - Quiz System - E-mail Client system - Cryptanalysis – Health Care Systems. Use Open-source CASE Tools: Star UML/ UML Graph for the above case studies.

SUGGESTED BOOKS

1. Grady Booch, 2007. Object Oriented Analysis and Design, 3rd Edition, Addison Wesley, New Delhi. [UNIT 1 to 4]
2. Martin Fowler, Kendall Scott, 2004. “UML Distilled”, 2nd Edition, Pearson Education, New Delhi. [UNIT 5]
3. James Rumbaugh, Ivar Jacobson and Grady Booch, 2003. “The Unified Modeling Language Reference Manual”, 1st Edition, Addison Wesley, New Delhi.
4. Boar, 2004. “Xml Web Services in The Organization”, Wp publisher

WEB LINKS:

1. <http://www.uml-tutorials.trireme.com/>
2. [http://www.devshed.com/c/a/Practices/Introducing-UMLObjectOriented-Analysis-and- Design/](http://www.devshed.com/c/a/Practices/Introducing-UMLObjectOriented-Analysis-and-Design/)
3. <http://community.sparxsystems.com/tutorials/object-oriented-analysis-and-design>

NPTEL

1. <https://nptel.ac.in/courses/106105153>

SEMESTER-II
SEMANTIC WEB AND ONTOLOGIES
(THEORY)

4H-4C

Instruction Hours/week: L:4 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3Hours

Course Objectives

- To represent data from a chosen problem in XML with appropriate semantic tags obtained or derived from the ontology.
- To understand the semantic relationships among these data elements using Resource.
- To design and implement a web services application that “discovers” the data and/or other Description Framework (RDF).
- To understand the capabilities and limitations of semantic web technology for many applications.
- To learn the framework of JENA

Course Outcomes (Cos)

Upon completion of the course, students will be able to

COs	Course Outcomes	Blooms Level
CO1	Analyze fundamental concepts, advantages and limits of the semantic web	Analyze
CO2	Implement ontologies in the context of developing semantic web	Apply
CO3	Implement RDF framework and associated technologies for developing semantic web	Apply
CO4	Examine the various languages and properties of Web Ontologies	Analyze
CO5	Implement semantic Web Tools like Jena and SPARL for developing architecture for semantic web	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S	S	M	S							
CO2	S	L	M	S	L				L	M	S	
CO3	M	M	S	S	M							
CO4	M	S	L	M	S						L	
CO5	S	M	M	S	M		L		S			

S-Strong; M-Medium; L-Low

UNIT-I Introduction**8 HOURS**

Introduction to the Syntactic web and Semantic Web – Evolution of the Web – The visual and syntactic web – Levels of Semantics – Metadata for web information - The semantic web architecture and technologies –Contrasting Semantic with Conventional Technologies –Semantic Modeling - Potential of semantic web solutions and challenges of adoption

UNIT-II Ontological Engineering**8 HOURS**

Ontologies – Taxonomies –Topic Maps – Classifying Ontologies – Terminological aspects: concepts, terms, relations between them – Complex Objects –Subclasses and Sub-properties definitions – Upper Ontologies – Quality – Uses - Types of terminological resources for ontology building – Methods and methodologies for building ontologies – Multilingual Ontologies -Ontology Development process and Life cycle – Methods for Ontology Learning – Ontology Evolution – Versioning

UNIT-III Structuring and Describing Web Resources**8 HOURS**

Structured Web Documents - XML – Structuring – Namespaces – Addressing – Querying – Processing - RDF – RDF Data Model – Serialization Formats- RDF Vocabulary – Inferencing - RDFS – basic Idea – Classes – Properties- Utility Properties – RDFS Modeling for Combinations and Patterns- Transitivity

UNIT-IV Web Ontology Language**8 HOURS**

OWL – Sub-Languages – Basic Notions -Classes- Defining and Using Properties – Domain and Range – Describing Properties - Data Types – Counting and Sets- Negative Property Assertions – Advanced Class Description – Equivalence – Owl Logic.

UNIT-V Semantic Web Tools and Applications**8 HOURS**

Development Tools for Semantic Web – Jena Framework – SPARL –Querying semantic web - Semantic Wikis - Semantic Web Services – Modeling and aggregating social network data - Ontological representation of social relationships, Aggregating and reasoning with social network data Understand semantic web basics, architecture and technologies

SUGGESTED BOOKS

1. Grigoris Antoniou, Frank van Harmelen. 3rd Edition (2012), A Semantic Web Primer.,MIT Press, USA
2. Liyang Yu (2011), “A Developer's Guide to the Semantic Web”, First Edition ,Springer.
3. John Hebel, Matthew Fisher, Ryan Blace and Andrew Perez-Lopez (2009), “Semantic Web Programming”, First Edition Wiley.

4. Robert M. Colomb(2007), “Ontology and the Semantic Web”, Volume 156 Frontiers in Artificial Intelligence and Applications (Frontier in Artificial Intelligence and Applications), IOS Press.
5. Dean Allemang and James Hendler(2011), “Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL, Second Edition, Morgan Kaufmann..
6. Karin Breitman, Marco Antonio Casanova and Walt Truszkowski,(2010), “Semantic Web: Concepts, Technologies and Applications (NASA Monographs in Systems and Software Engineering)”, Springer.

SEMESTER-II
NATURAL LANGUAGE PROCESSING
(THEORY)

4H-4C

Instruction Hours/week: L:4 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3Hours

Course Objectives

- To introduce the fundamental concepts and techniques of natural language processing (NLP)
- To understanding of the models and algorithms in the field of NLP.
- To demonstrate the computational properties of natural languages and
- To develop the commonly used algorithms for processing linguistic information.
- To understanding Lexical and syntactic levels of languages for processing

Course Outcomes (COs)

Upon completion of the course, students will be able to

COs	Course Outcomes	Blooms Level
CO1	Understand the fundamental concepts and techniques of natural language processing (NLP)	Understand
CO2	Understanding of the models and algorithms in the field of NLP	Understand
CO3	Demonstrate the computational properties of natural languages and develop the commonly used algorithms for processing linguistic information.	Apply
CO4	Understand Lexical and syntactic levels of languages for processing	Understand
CO5	Understand semantics and pragmatics of languages for processing	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	M		M							
CO2	L	S	L		M							
CO3	M	M	S		S							
CO4	S	S	L		L							
CO5	M	L	M		M							

S-Strong; M-Medium; L-Low

UNIT I -Introduction to NLP**8 HOURS**

Introduction – Models -and Algorithms - The Turing Test -Regular Expressions Basic Regular Expression Patterns -Finite State Automata -Regular Languages and FSAs – Morphology -Inflectional Morphology - Derivational Morphology – Finite – State Morphological Parsing - Combining an FST Lexicon and Rules -Porter Stemmer

UNIT II -N-grams Models**8 HOURS**

N-grams Models of Syntax - Counting Words - Unsmoothed N-grams – Smoothing- Backoff - Deleted Interpolation – Entropy - English Word Classes - Tag sets for English - Part of Speech Tagging -Rule-Based Part of Speech Tagging - Stochastic Part of Speech Tagging – Transformation-Based Tagging.

UNIT III- Context Free Grammars**8 HOURS**

Context Free Grammars for English Syntax- Context-Free Rules and Trees – Sentence-Level Constructions –Agreement – Sub Categorization – Parsing – Top-down – Early Parsing -Feature Structures - Probabilistic Context-Free Grammars

UNIT IV- Representing Meaning**8 HOURS**

Representing Meaning - Meaning Structure of Language - First Order Predicate Calculus- Representing Linguistically Relevant Concepts -Syntax-Driven Semantic Analysis - Semantic Attachments - Syntax-Driven Analyzer - Robust Analysis - Lexemes and Their Senses - Internal Structure - Word Sense Disambiguation -Information Retrieval

UNIT V- Discourse**8 HOURS**

Discourse -Reference Resolution - Text Coherence -Discourse Structure - Dialog and Conversational Agents - Dialog Acts – Interpretation – Coherence -Conversational Agents - Language Generation – Architecture -Surface Realizations – Discourse Planning – Machine Translation -Transfer Metaphor – Interlingua – Statistical Approaches.

SUGGESTED BOOKS

1. D. Jurafsky and J. Martin,2020. “Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”.
2. Daniel J and James H. Martin, Speech and language processing, 2009. “An introduction to natural language processing, computational linguistics & speech recognition”, Prentice hall.
3. Lan H Written and Elbef, MarkA.Hall, 2013. “Data Mining: Practical Machine Learning Tools And Techniques”, Morgan Kaufmann.

WEB LINKS:

1. https://www.onlinecourses.swayam2.ac.in/aic20_sp06/preview
2. https://www.onlinecourses.swayam2.ac.in/arp19_ap79/preview
3. https://www.tutorialspoint.com/natural_language_processing/index.htm

SEMESTER-II
J2EE-PRACTICAL
(PRACTICAL)

4H-2C

Instruction Hours/week: L:0 T:0 P:4

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

Course Objectives

- To learn J2EE as an architecture and platform for building and deploy web-based, n-tier, transactional, component-based enterprise applications.
- To develop the different types of applications, such as JDBC (Java Database Connectivity) used for making connection between the java programs and database.
- To learn JSP and servlets to create the dynamic web page, RMI (Remote Method Invocation) to create the remote objects.
- To know the JavaBean for creating and developing various applications.
- To understand the functioning of JSP.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Characterize the concepts J2SE and J2EE.	Understand
CO2	Develop Enterprise Applications using Session Bean, Entity Bean and MDB.	Apply
CO3	Java Servlets are used in embedded systems, wireless communication, and any other generic request/response application.	Understand
CO4	The EJB specification creates an infrastructure that takes care of the system-level programming.	Apply
CO5	A Java Bean is a reusable software component that can be visually manipulated in builder tools.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			S	M				L	M		
CO2	L			L	M				M	M		
CO3	M			M	M							
CO4	M			L	M						L	M
CO5	S	M	M	S	S							

S-Strong; M-Medium; L-Low

List of Programs**40 HOURS**

1. Write A JAVA Servlet Program to Implement and Demonstrate Get () And Post Methods (Using HTTP Servlet Class).
2. Write A JAVA Servlet Program to Implement Request dispatcher Object (Use Include () And Forward () Methods).
3. Write A Java JSP Program to Implement Verification of a Particular User Login and Display a Welcome Page.
4. Write A JAVA Servlet Program to Implement Sessions (Using HTTP Session Interface).
5. Write A JSP Program Which Uses Jsp: Include & Jsp: Forward Action to Display a Web Page.
6. Write A JSP Program to Implement All the Attributes of Page Directive Tag.
7. Write a Java Program that reads on file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.
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 a menu applet into JSP page.

SUGGESTED BOOKS:

1. Jim Keogh, 2017. The Complete Reference J2EE, 1st Edition, Tata Mc Graw Hill Edition, New Delhi.
2. Herbert Schildt, Java: The Complete Reference, Eleventh Edition, Kindle Edition, New Delhi.
3. Tarun Singh, 2016. Java/J2EE, PHP, JSF, JSP, Servlet, Spring 4.0, Spring Boot 1.5, Hibernate 5.0, Bootstrap, HTML5, CSS3 and XML.

WEB LINKS:

1. <https://www.javatpoint.com/java-programs>
2. <https://www.tutorialspoint.com/java/index.htm>
3. http://www.dsc.ufcg.edu.br/~jacques/cursos/j2ee/recursos/j2ee-1_3-doc-tutorial-draft5.pdf.
4. http://kuvempu.ac.in/eng/studymetrial/Login/Admin/study_material/362417-04-2020J2EE%20Part-B.pdf

SEMESTER-II
MOBILE COMPUTING -PRACTICAL
(PRACTICAL)

4H-2C

Instruction Hours/week: L:0 T:0 P:4

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

Course Objectives

- 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 Ad hoc Networks
- To know the techniques involved in Vehicular Ad hoc Networks.
- To demonstrate the features of Android Mobile Operating System for developing Android Applications

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Analyze the architecture, merits and demerits of Wireless technologies like Infra-Red, blue tooth, Wi-Fi, RFID and Wi-Max.	Understand
CO2	Characterize the principles of mobile technologies like GPRS, GSM, CDMA, and TDMA	Apply
CO3	Compare the characteristics and techniques MANET with VANET	Understand
CO4	Analyze technology of 1G, 2G, 3G and 4G for gaining the working knowledge of four generation wireless technologies.	Apply
CO5	Apply the features of Android programming for developing Android Applications	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	M	M	S							
CO2	M	S	M	M	M							
CO3	M	L	M	M	S							
CO4	M	S	M	M	M							
CO5	M	S	M	M	L							

S-Strong; M-Medium; L-Low

List of Programs**40 HOURS**

1. Write a program to build your first Android Application “Hello World” with common activity.
2. Write a program which will implement Sub menu in android application.
3. Write a program to display the use of Relative Layout Views with different attributes.
4. Implement an application that writes data to the SD card.
5. Implement an application that creates an alert upon receiving a message
6. Write a program to implement a Custom Button and handle the display message on button press.
7. Write a program to implement the List View in your android application.
8. Write a program to implement between animations and rotate the text in your android application.
9. Write a sample program to create a progress bar for your android applications.
10. Write a program which enables you to draw an image using bitmap class object.
11. Develop a native application that uses GPS location information
12. Write a mobile application that makes use of RSS feed
13. Develop a mobile application to send an email.

SUGGESTED BOOKS

1. Asoke K. Talukder, Roopa R, 2011. “Mobile Computing: technology, applications, and service creation”, Tata McGraw Hill, New Delhi
2. Brian Fling, 2009. “Mobile Design and Development”, O’Reilly Media Inc.
3. Ashok K Talukder and Roopa R Yuvalgal, 2005. “Mobile Computing”, Tata McGraw Hill Publishing Company Limited.
4. Ivan Stojmenovic, 2002. “Handbook of Wireless Networks and Mobile Computing”, A Wiley-Inter science Publication.
5. Jochen Schiller, 2000. “Mobile Communication”, Addison Wesley.

WEB LINKS:

1. http://ps.fragmel.edu.in/~dipalis/prgdwnl/Mobile_Computing_Manual_CompEngg%20Sem%20VII.pdf
2. <https://www.wileyindia.com/mobile-communication-and-computing-includes-lab-exercises.html>

SEMESTER-II
DATABASE ADMINISTRATION-PRACTICAL
(PRACTICAL)

4H-2C

Instruction Hours/week: L:0 T:0 P:4

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

Course Objective

- To install and configure database
- To create users and assign roles
- To optimize schemas, tables, indexes and views
- To manage database services and clients
- To move the data from one database to another database.

Course Outcomes (Cos)

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

COs	Course Outcomes	Blooms Level
CO1	Design, model and install any database management systems by using Oracle database as sample.	Apply
CO2	Plan, design, construct, control and manage database instances, database network environment, storage structures, user security, database backup and recovery, database maintenance.	Apply
CO3	Define and devise transaction management, concurrency control, crash recovery components.	Understand
CO4	Examine and perform data base administration roles and examine the database operations by using Oracle database system as a sample	Analyze
CO5	Apply the knowledge of VLDB to control the distributed databases	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M									
CO2	M	M	S									
CO3	S	M	S									
CO4	M	S	S									
CO5	S	M	L									

S-Strong; M-Medium; L-Low

List of Programs**40 HOURS**

1. Demo for Globalization Support
2. Setup Listener Security
3. Configuring Recovery Manager
4. Write a program Using Recovery Manager
5. Write a program for Managing Diagnostic Sources
6. Implement Database Recovery
7. Demo for Flashback Database
8. Implement User Error Recovery
9. Write a program for Dealing with Corruption
10. Show the demo for Automated Management
11. Creating a database and do the manipulation.
12. Managing index tables

SUGGESTED BOOKS

1. Amarnath Reddy, 2018. "Oracle DBA 11g/12c – Database Administration for junior DBA".
2. Saikat Basak, 2010. "Oracle DBA Concise Handbook", Ensel Software.
3. Bob Bryla, Kevin Loney, 2008. "Oracle Database 11g DBA Handbook", McGraw-HillOsborne.

WEB LINKS:

1. <https://www.oracletutorial.com/oracle-administration/>
2. <https://www.udemy.com/course/sql-server-administration-practicals/>
3. <https://www.pluralsight.com/resource-center/guides/guide-to-becoming-a-database-admin>

SEMESTER-II
NETWORK SECURITY-PRACTICAL
(PRACTICAL)

4H-2C

Instruction Hours/week: L:0 T:0 P:4

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

Course Objectives

- To teach fundamental aspects of security in a modern networked environment with the focus on system design aspects and cryptography in the specific context of network.
- To build protection mechanisms in order to secure computer networks.
- To write coding to encrypt “Plain Text” into “Cipher Text” and vice versa, using different encryption algorithms.
- To choose a suitable ciphering algorithm according to the required security level.
- To build cryptosystems by applying encryption algorithms.

Course Outcomes (Cos)

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

COs	Course Outcomes	Blooms Level
CO1	Classify the symmetric encryption techniques and illustrate various public key cryptographic techniques	Analyze
CO2	Evaluate the authentication and hash algorithms.	Apply
CO3	Summarize the intrusion detection and its solutions to overcome the attacks	Understand
CO4	Demonstrate the basic concepts of system level security	Apply
CO5	Apply the block chain technology for security	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	S	M		S	M	S			
CO2	M	L	L		S						L	
CO3	S		S		L			S	M			
CO4	M			L	S		S		L			L
CO5	S	M	L	M	L		M		M			

S-Strong; M-Medium; L-Low

List of Programs**40 HOURS**

1. Write a program to convert your college name from plain text to cipher text using Transposition cipher method of encryption.
2. Write a program to convert your name from plain text to cipher text using the One Time Pads method of encryption.
3. Write a program to encrypt a paragraph using the Data Encryption Standard Algorithm.
4. Write a program to encrypt your biodata using the Advanced Encryption Standard Algorithm.
5. Write a program to decrypt the “Network Security” theory syllabus using the RSA Algorithm.
6. Write a program that takes a binary file as input and performs bit stuffing and Cyclic Redundancy Check Computation.
7. Write a program to simulate the working of Sliding-Window protocol.
8. Write a program to find the shortest path in a network using Dijkstra's Algorithm.
9. Write a program to implement *International Data Encryption Algorithm (IDEA)*.

SUGGESTED BOOKS

1. William Stallings, 2013. “Cryptography and Network Security”, 6th Edition. Pearson Education, New Delhi.
2. A. Menezes, P. Van Oorschot and Vanstone, 2010. “Hand Book of Applied Cryptography”, 2nd Edition. CRC Press, New Delhi.
3. Ankit Fadia, 2010. “Network Security”, 2nd Edition. McMillan India Ltd, New Delhi.
4. Bruce Schneir, 2006. “Applied Cryptography”, 2nd Edition. CRC Press, New Delhi.

WEB LINKS:

1. williamstallings.com/Crypto3e.html
2. u.cs.biu.ac.il/~herzbea/book.html
3. www.flipkart.com/search-books/cryptography+and+network+security+William+stallings+ebook

SEMESTER-II
SOFTWARE TESTING AND QUALITY ASSURANCE-PRACTICAL
(PRACTICAL) 4H-2C

Instruction Hours/week: L:0 T:0 P:4 Marks: Internal:40 External:60 Total:100
End Semester Exam: 3 Hours

Course Objectives

- To perform test each time they are run, thereby eliminating human error.
- To test how the software reacts under repeated execution of the same operations.
- To program sophisticated tests which bring out hidden information from the application.
- To reuse tests on different versions of an application, even if the user interfaces changes.
- To know the risks in project management system

Course Outcomes (COs)

Upon completion of this course, students will be able to

COs	Course Outcomes	Blooms Level
CO1	Test the software by applying testing techniques to deliver a product free from bugs	Analyze
CO2	Evaluate the web applications using bug tracking tools	Apply
CO3	Investigate the scenario and the able to select the proper testing technique and explore the test automation concepts and tools	Understand
CO4	Deliver quality product to the clients by way of applying standards such as TQM, Six Sigma	Apply
CO5	Evaluate the estimation of cost, schedule based on standard metrics	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L	M	S	M	L				S	M		
CO2			L						L		L	
CO3	S	M	L	M	M				L	M	L	M
CO4	M	S			M							
CO5			L	M	S				L	M		

S-Strong; M-Medium; L-Low

List of Programs**40 HOURS**

1. Create a VB form with the following fields and create the database also for them. Insert 3 records. Using Win Runner tool record the above 3 transaction and test them and produce the Report. (Black box Testing).
2. Create a VB form and then add login dialog form. Using Win Runner tool check the Username and Password and produce the Report. (Security testing).
3. Create a VB form with the following fields and check the calculation is correct or not by using the test tool Win Runner. (Functional Testing) Fields – Name, Designation, Department, Basic, HRA, DA, PF and netsal.
4. Using Win Runner test tool check the database values after changing. Using Flight database. (Regression testing).
5. Write a C program for Boundary Testing.
6. Write a C program for Loop Testing.
7. Write a C program for Interface Testing.
8. Write a C program for Unit testing.
9. To Perform Checking GUI Objects using Win Runner tool
10. To perform Synchronization test using Win Runner

Software Quality Assurance

1. To develop a banking application, perform the requirement analysis and give a quality status report.
2. Perform the system testing to develop an electricity application and give a quality status report.
3. Perform the report design and give a quality status report.
4. Develop a library management system and give a quality status report.
5. Develop a hospital management system and a quality status report and give a comparison performance report in Linux and windows operating system.

SUGGESTED BOOKS

1. Dorothy Graham, Rex Black, and et.al, 2011. “Foundations of Software Testing - ISTQB Certification”, 3rd Edition, Cengage Learning
2. R. Rajani, and P.P. Oak, 2004. “Software Testing”, Tata McGraw Hill, New Delhi.
3. Boris Beizer, 2003. “Software Testing Techniques”, II Edition., DreamTech India, New Delhi. (UNIT – I, II, III, IV)
4. Marnie L Hutcheson, 2003. “Software testing fundamentals”, 1st Edition, Wiley, DreamTech India, New Delhi. (UNIT – V)
5. Burnstein, 2003. “Practical Software Testing”, Springer International Edition.

WEB LINKS:

1. <https://www.altexsoft.com/whitepapers/quality-assurance-quality-control-and-testing-the-basics-of-software-quality-management/>
2. <https://www.softwaretestinghelp.com/what-is-actual-testing-process-in-practical-or-company-environment/>
3. <https://gaminglabs.com/services/professional-services/software-quality-assurance-testing-practice/>

SEMESTER-II
ANGULAR JS-PRACTICAL
(PRACTICAL)

4H-2C

Instruction Hours/week: L:0 T:0 P:4

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

Course Objectives

- To utilize AngularJS formats adequately
- To make the perplexing structures quickly
- To confine web applications to take into account worldwide groups of onlookers
- To make Secured web application s from dangers and pernicious clients
- To understand the compiler for building better and more propelled orders

Course Outcomes (Cos)

Upon successful completion of this course, students will be able to:

COs	Course Outcomes	Blooms Level
CO1	To apply an AngularJS Single Page Application from scratch	Apply
CO2	To build an awesome User Interface, to create and bind controllers with JavaScript	Understand
CO3	To separate the model, view, and controller layers of your application and implement them using AngularJS	Apply
CO4	To integrate and enhance Angular applications with other useful JavaScript libraries such as Node.js	Analyze
CO5	Test the application using AngularJS	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M			S	L							
CO2	M			S	M							
CO3	S	M	L									
CO4	M		M									
CO5	L		M	S	L							

S-Strong; M-Medium; L-Low

List of Programs

40 HOURS

1. Write a simple program using AngularJS modules and controllers.
2. Create a page using AngularJS that will add two numbers
3. Write a program to perform arithmetic operations using AngularJS expressions
4. Create an automatic counter using AngularJS
5. Create a simple calculator in AngularJS
6. Create an Employee Database and apply filters on it.
7. Implement Dependency Injection in AngularJS - with and without introspection
8. Write a program to Fetch data with \$http Using GET
9. Create a simple pages or tabs using AngularJS
10. Create a Student Information form with submit and reset functionality
11. Implement Client-side validation in AngularJS
12. Implement simple routing in AngularJS application

SUGGESTED BOOKS

1. Chandiramani Arora, Kevin Hennessy, 2018. “Angular 6 by Example: Get up and running with Angular by building modern real-world web apps”, 3rd Edition, Kindle Edition.
2. Agus Kurniawan, 2014. “AngularJS Programming by Example”, First Edition
3. Adam Freeman, 2014. “Pro AngularJS “, First Edition, A press.
4. Brad Green and Shyam Seshadri, 2013. “Angular JS”, O'Reilly Publications, First edition.

WEB LINKS:

1. <https://tutorialzine.com/2013/08/learn-angularjs-5-examples>
2. https://leanpub.com/Practical_AngularJS/read
3. <https://dwmkerr.com/practical-angularjs-part1/>

SEMESTER-II
FOUNDATIONS OF DATA SCIENCE-PRACTICAL
(PRACTICAL)

4H-2C

Instruction Hours/week: L:0 T:0 P:4

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

Course Objectives

- To study the basic concepts of Data Science and data lifecycle.
- To understand the theoretical and mathematical aspects of Data Science models.
- To learn common random variables and their uses, and with the use of empirical distributions.
- To obtain the knowledge in data management tools.
- To explore the major techniques for data science.

Course Outcomes (Cos)

Upon successful completion of this course, students will be able to:

COs	Course Outcomes	Blooms Level
CO1	Understand the key concepts in data science, including tools and approaches.	Understand
CO2	Understand the concepts in data collection, sampling and probabilistic models.	Understand
CO3	Understand the various techniques in data science	Understand
CO4	Apply the mathematical formulation of machine learning and statistical models to visualize the data in various methods	Apply
CO5	Apply a suitable data science technique to solve an information analytics problem.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S		L								
CO2	L											
CO3	S	S	L	M			M	S	M			
CO4	L		M	S						L	M	
CO5	M		S	M								

S-Strong; M-Medium; L-Low

List of Programs**40 HOURS**

1. Matrix manipulations.
2. Creating and manipulating a List and an Array.
3. Manipulation of vectors and matrix.
4. Operators on Factors in R
5. Working with looping statements.
6. Find subset of dataset by using subset (), aggregate () functions on iris dataset
7. Find the data distributions using box and scatter plot.
8. Find the correlation matrix and plot the correlation plot on dataset and visualize it

SUGGESTED BOOKS

1. Saltz Jeffrey S, 2019. “An Introduction to Data Science”, Second Edition, Sage Publications Inc.
2. Peter Bruce & Andrew Bruce, 2017. “Practical Statistics for Data Scientists”, First Edition, O’Reilly Publication.
3. Murtaza Haider, 2015. “Getting Started with Data Science: Making Sense of Data with Analytics”, IBM Press.
4. Glenn J. Myatt, Wayne P. Johnson, 2014. “Making Sense of Data I: A Practical Guide to Exploratory Data Analysis and Data Mining”, Second Edition, John Wiley & Son Publication
5. Dawn Griffiths, 2008. “Head First Statistics”, First Edition, O’Reilly Publication

WEB LINKS:

1. <https://www.inferentialthinking.com/chapters/intro>
2. <https://www.openintro.org/stat/>
3. https://swayam.gov.in/nd1_noc20_cs36/preview
4. https://swayam.gov.in/nd1_noc19_cs60/preview
5. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-0002-introduction-to-computational-thinking-and-data-science-fall-2016>

SEMESTER-III
MACHINE LEARNING WITH PYTHON
(THEORY)

4H-4C

Instruction Hours/week: L:4 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- Define the types and theory of machine learning.
- Describe the classification models of machine learning
- Explain the techniques of distance-based models of machine learning
- Examine the various tree based and rule-based models of machine learning
- Demonstrate the concept of reinforcement learning for game playing

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Analyze theory of machine learning components and models.	Analyze
CO2	Characterize the algorithms of machine learning to learn linear and non-linear models	Analyze
CO3	Implement data clustering algorithms for machine learning process	Apply
CO4	Construct machine learning algorithms to learn tree and rule-based models.	Apply
CO5	Develop the applications in game playing	Create

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M	S		L							
CO2	L											
CO3	S		S	L	M			M	S	M		
CO4		L		M	S						L	M
CO5		M		S	M							

S-Strong; M-Medium; L-Low

UNIT I - Introduction to Machine Learning

9 HOURS

Human Learning - Types – Machine Learning - Types - Problems not to be solved - Applications - Languages/Tools– Issues. Preparing to Model: Introduction - Machine Learning Activities - Types of data - Exploring structure of data – Data quality and remediation - Data Preprocessing.

UNIT II - Model Evaluation and Feature Engineering -Model Evaluation 9 HOURS

Model Selection - Training Model - Model Representation and Interpretability - Evaluating Performance - of a Model - Improving Performance of a Model - Feature Engineering: Introduction - Feature Transformation – Feature- Subset Selection.

UNIT III - Supervised Learning-Classification 10 HOURS

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

UNIT IV- Unsupervised Learning and Artificial Neural Network 10 HOURS

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

UNIT V- Python Libraries 10 HOURS

Python libraries suitable for Machine Learning (numpy, scipy, scikit-learn, opencv)- Implementation of regression model on IRIS datasets. - Implementation of Model Evaluation Metrics using sci-kit learn and IRIS datasets -Implementation of K-Means clustering for IRIS datasets’

SUGGESTED BOOKS

1. Tom.M.Mitchell, 2017. Machine Learning, Tata McGraw Hill Publications
2. Y. S. Abu - Mostafa, M. Magdon-Ismail, and H.-T. Lin., 2012. Learning from Data,AML Book Publishers.
3. P. Flach, 2012. “Machine Learning: The art and science of algorithms that make sense of data”, Cambridge University Press.
4. K. P. Murphy, 2012. Machine Learning: A probabilistic perspective, MIT Press,
5. D. Barber, 2012. Bayesian Reasoning and Machine Learning, Cambridge University Press.
6. Saikat Dutt, Subramanian Chandramouli and Amit Kumar Das, "Machine Learning", 1st Edition, Pearson Education, 2019
7. Aurelien Geron, “Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow”, 2nd Edition, O’Reilly, 2019.
8. Willi Richert, Luis Pedro Coelho, “Building Machine Learning Systems with Python”, 2nd Edition, Packt Publishing Ltd., 2015

WEB LINKS:

1. <https://machinelearningmastery.com/linear-regression-for-machine-learning/>
2. <https://www.cambridge.org/core/books/machine-learning/distancebased-models/>
3. <https://dzone.com/articles/machine-learning-with-decision-trees>
4. <http://reinforcementlearning.ai-depot.com/>

NPTEL

1. <https://nptel.ac.in/courses/106106139/>
2. https://swayam.gov.in/nd1_noc19_cs81/preview

SEMESTER-III
.NET PROGRAMMING
(THEORY)

4H-4C

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

End Semester Exam:3 Hours

Course Objectives

- Create windows forms using arrays and flow control statements.
- Learn to use the classes and namespaces in the .NET Framework class library.
- Develop Web Applications using Microsoft ASP.NET programming.
- Learn to use Basic windows controls using Visual Basic.Net
- Understand the concept of Multiple Document Interface

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Develop Windows based applications using Visual Basic.Net	Apply
CO2	Implement ADO.Net concept in VB.Net and ASP.Net applications	Apply
CO3	Create server-side web applications using ASP.NET	Understand
CO4	Analyze the concept of data sources and data bound controls in VB.NET and ASP.NET	Apply
CO5	Demonstrate the working of ADO.Net controls for developing ASP.Net web applications	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S		L									
CO2												
CO3	S	L	M			M	S	M				
CO4		M	S						L	M		
CO5		S	M									

S-Strong; M-Medium; L-Low

UNIT I – Introduction**9 HOURS**

Getting Started With VB.NET: The Integrated Development Environment-IDE Components- Environment Options. Visual Basic: The Language Variables-Constants-Arrays – Variables as Objects-Flow Control Statements. Working with forms: The appearance of Forms-Loading and Showing Forms-Designing Menus.

UNIT II - Basic Windows Controls**9 HOURS**

Textbox Control- ListBox, CheckedListBox-Scrollbar and TrackBar Controls-More Windows Control-The common Dialog Controls-The Rich TextBox Control - Handling Strings, characters and Dates. The TreeView and ListView Controls: Examining the Advanced Controls.

UNIT III - ASP.NET**10 HOURS**

Goal of ASP.NET –ASP.NET Web Server Control-Validation Server Controls-Themes and Skins - Content Page Holder,ASP.NET - Web Forms, MVC, Core.

UNIT IV - Data Binding in ASP.Net**10 HOURS**

Data source Controls – Configuring data source control caching – storing connection information - Using Bound list controls with Data Source Controls – Other Data bound Controls-Data Management with ADO.Net and Working with databases.

UNIT V - Web services, WCF**10 HOURS**

Development & consuming web services, WCF Services, Fundamentals WCF Concepts, Creating a New Service, Generating a Service and Client Proxy, Hosting a service in IIS, Messaging protocol, WCF Contracts and Serialization, Service Contracts, Approaches to Serialization, Web Service Bindings, Object Oriented Bindings, One way and Duplex Communication, Large Message Transfers, Hosting Features, Hosting in IIS, WCF Exception Handling.

SUGGESTED BOOKS

1. Evangelos Petroutsos, 2017. Mastering Visual Basic.Net, BPB Publications, New Delhi.
2. Shirish Chavan. 2007. Visual Basic.Net, 1st Edition, Pearson Education, New Delhi.
3. Bill Evjen, Scott Hanselman, Devin Rader, Farhan Muhammad and S.SrinivasaSivakumar, 2006. Professional ASP.net 2.0, Special Edition.
4. Duncan Mackenzie Kent Sharkey, 2006. Sams Teach yourself Visual Basic.JNet, 1st Edition, McGraw Hill, New Delhi.
5. Dave Mercer, ASP.Net Beginner's Guide, 2003. 2nd Edition McGraw Hill, New Delhi.

WEB LINKS:

1. www.microsoft.com/NET/
2. www.en.wikipedia.org/wiki/.net
3. www.w3schools.com/ngws/default.asp
4. www.vbtutot.com

NPTEL

1. http://www.nptelvideos.com/visualbasic_net/visualbasicnet_video_tutorials.php
2. https://www.nptelvideos.com/visualbasic_net/?pn=1

SEMESTER-III
CYBER FORENSICS AND SECURITY
(THEORY)

4H-3C

Instruction Hours/week: L:4 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- Learn the foundations of Cyber Forensics and Security
- systematically educate the necessity to understand the impact of cyber-crimes and threats with solutions in a global and societal context.
- select suitable ethical principles and commit to professional responsibilities and human values and contribute value and wealth for the benefit of the society
- Based on the Risk assessment, plan suitable security controls, audit and compliance.
- Evaluate and communicate the human role in security systems with an emphasis on ethics, social engineering vulnerabilities and training.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Correctly define and cite appropriate instances for the application of computer forensics Correctly collect	Understand
CO2	Analyze computer forensic evidence Identify the essential	Analyze
CO3	Examine Data Recovery – Evidence Collection up-to-date concepts, algorithms, protocols, tools, and methodology of Computer Forensics	Analyze
CO4	Analyse and evaluate the digital payment system security and remedial measures against digital payment frauds. Analyse and evaluate the importance of personal data its privacy and security.	Analyze
CO5	Analyse and evaluate the security aspects of social media platforms and ethical aspects associated with use of social media.	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M		S						L		
CO2	M	S	M	M					L			
CO3	S	L	S	L								
CO4	L	M	L	M						M		
CO5		M	M	S								

S-Strong; M-Medium; L-Low

UNIT–I Introduction**9 HOURS**

Computer Forensics Fundamentals – Types of Computer Forensics Technology – Types of Computer Forensics Systems – Vendor and Computer Forensics Services.

UNIT–II Computer forensics evidence and capture**9 HOURS**

Data Recovery – Evidence Collection and Data Seizure-Duplication and Preservation of Digital Evidence-Computer Image Verification and Authentication.

UNIT–III Computer forensic analysis:**10 HOURS**

Discover of Electronic Evidence-Identification of Data – Reconstructing Past Events – Fighting against Macro Threats – Information Warfare Arsenal – Tactics of the Military – Tactics of Terrorist and Rogues – Tactics of Private Companies.

UNIT-IV Introduction to Cyber security**10 HOURS**

Defining Cyberspace and Overview of Computer and Web-technology- Architecture of cyberspace- Communication and web technology-Internet-World Wide Web-Advent of internet-Internet infrastructure for data transfer and governance-Internet Society-Regulation of cyberspace-Concept of cyber security-Issues and challenges of cyber security.

UNIT-V Social Media Overview and Security**10 HOURS**

Introduction to Social Networks-Types of social media-Social media platforms-Social media monitoring- Hashtag-Viral Content-Social media marketing-Social media privacy-Challenges- opportunities and pitfalls in online social network-Security issues related to social media-Flagging and reporting of inappropriate content-Laws regarding posting of inappropriate content- best practices for the use of social media.

SUGGESTED BOOKS

1. Mari E-Helen Maras, “Computer Forensics: Cybercriminals, Laws, and Evidence”, Jones & Bartlett Learning; 2nd Edition, 2014.
2. Chad Steel, “Windows Forensics”, Wiley, 1st Edition, 2006.
3. Majid Yar, “Cybercrime and Society”, SAGE Publications Ltd, Hardcover, 2nd Edition, 2013.
4. C. Altheide& H. Carvey Digital Forensics with Open-Source Tools, Syngress, 2011.
ISBN: 9781597495868.
5. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011)
6. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry Oliver, Create Space Independent Publishing Platform. (Pearson, 13th November, 2001)

WEB LINKS:

1. <https://esu.desire2learn.com/>
2. <https://www.geeksforgeeks.org/cyber-forensics/>
3. <https://www.techtarget.com/searchsecurity/definition/computer-forensics>

SEMESTER-III
DATA MINING AND DATA WAREHOUSING
(THEORY)

4H-4C

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

End Semester Exam: 3 Hours

Course Objectives

- To gain the knowledge of the concepts and techniques in data mining
- To understand the data mining functionalities and pattern classification.
- To understand the cleaning and clustering process of data mining.
- To gain the knowledge of data warehouse architecture in data mining process
- To know about the Multimedia database

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	To understand the data mining process of voluminous data using OLAP	Apply
CO2	To implement the preprocessing concept in data mining applications	Apply
CO3	To apply the data mining algorithms on big-data to extract useful data	Understand
CO4	To implement data mining techniques for complex data types	Apply
CO5	To implement Decision Support System concept in data mining for developing intelligence business applications	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M	S		L							
CO2												
CO3			S	L	M			M	S	M		
CO4	M			M	S						L	M
CO5		M		S	M							

S-Strong; M-Medium; L-Low

UNIT I – Introduction**9 HOURS**

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

UNIT II - Classification and Regression Algorithms**9 HOURS**

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

Cluster Analysis: Partitional Clusterings – k-medoids – Birch

UNIT III - Mining Rule**10 HOURS**

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

UNIT IV - Types of Mining**10 HOURS**

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

UNIT V - Data Warehouse and OLAP Technology for Data Mining**10 HOURS**

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

SUGGESTED BOOKS

1. Jiawei Han and Micheline Kamber, 2011. Data Mining Concepts and Techniques, 3rd Edition, Elsevier, India (Unit I, III, IV, V)
2. G.K.Gupta, 2006. Introduction to Data Mining with Case Studies, Prentice Hall India, New Delhi (Unit – IV)
3. Soman.K.P, Shyam Divakar and V. Ajay, 2008. Insight to Data Mining- Theory and Practical, Prentice Hall India, New Delhi. (Unit – II).
4. Paulraj Ponniah, 2008. Data Warehousing Fundamentals: A Comprehensive Guide for IT Professionals, John Wiley & Sons, New Delhi.
5. Gupta.G.K., 2006. Introduction to Data Mining with Case Studies, Prentice Hall India, New Delhi.

6. Kantardzic, 2005. Mining Concepts, Models, Methods and Algorithms, IEEE Press
– A John Wiley & Sons.

WEB LINKS:

1. http://www.wikipedia.org/wiki/Data_mining
2. http://www.anderson.ucla.edu/faculty/jason.frand/teacher/technologies/palace/data_mining.ht
3. <https://www.theartling.com/text/dmwhite/dmwhite.htm>
4. <https://www.classcentral.com/course/swayam-data-mining-9821>

NPTEL

1. <https://nptel.ac.in/courses/106105174/>
2. <https://nptel.ac.in/courses/110107092/>

SEMESTER-III
SOFTWARE DEFINED NETWORK
(THEORY)

4H-4C

Instruction Hours/week: L:4 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To learn the fundamentals of software defined networks.
- To understand the separation of the data plane and the control plane.
- To study about the SDN Programming.
- To study about the various applications of SDN
- To analyse the expected future of SDN applications

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Differentiate between traditional networks and software defined networks	Analyze
CO2	Understand advanced and emerging networking technologies	Understand
CO3	Obtain skills to do advanced networking research and programming	Apply
CO4	Learn how to use software programs to perform varying and complex networking tasks	Analyze
CO5	Expand upon the knowledge learned and apply it to solve real world problems	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S		L								
CO2												
CO3		S	L	M			M	S	M			
CO4	M		M	S						L	M	
CO5			S	M								

S-Strong; M-Medium; L-Low

UNIT I - Introducing SDN**9 HOURS**

History of Software Defined Networking (SDN) – Modern Data Center – Traditional Switch Architecture – Why SDN – Evolution of SDN – How SDN Works – Centralized and Distributed Control and Data Planes

UNIT II - SDN Abstractions**9 HOURS**

How SDN Works - The Openflow Protocol - SDN Controllers: Introduction - General Concepts - VMware - Nicira - VMware/Nicira - OpenFlow-Related - Mininet - NOX/POX - Trema - Ryu - Big Switch Networks/Floodlight - Layer 3 Centric - Plexxi - Cisco OnePK

UNIT III - Programming SDN'S**10 HOURS**

Network Programmability - Network Function Virtualization - NetApp Development, Network Slicing

UNIT IV - SDN Applications and Use Cases**10 HOURS**

SDN in the Data Center - SDN in Other Environments - SDN Applications - SDN Use Cases - The Open Network Operating System 3

UNIT V - SDN'S FUTURE AND PERSPECTIVES**10 HOURS**

SDN Open Source - SDN Futures - Final Thoughts and Conclusions

SUGGESTED BOOKS

1. Software Defined Networks: A Comprehensive Approach by Paul Goransson and Chuck Black, Morgan Kaufmann Publications, 2014
2. SDN - Software Defined Networks by Thomas D. Nadeau & Ken Gray, O'Reilly, 2013
3. Software Defined Networking with OpenFlow By SiamakAzodolmolky, Packt Publishing, 2013
4. Feamster, Nick, Jennifer Rexford, and Ellen Zegura. "The road to SDN: an intellectual history of programmable networks." ACM SIGCOMM Computer Communication Review 44.2 (2014): 87-98.
5. Kreutz, Diego, et al. "Software-defined networking: A comprehensive survey." Proceedings of the IEEE 103.1 (2015): 14-76.
6. Nunes, Bruno AA, et al. "A survey of software-defined networking: Past, present, and future of programmable networks." Communications Surveys & Tutorials, IEEE 16.3 (2014): 1617-1634.
7. Lantz, Bob, Brandon Heller, and Nick McKeown. "A network in a laptop: rapid prototyping for software-defined networks." Proceedings of the 9th ACM SIGCOMM Workshop on Hot Topics in Networks. ACM, 2010.
8. Monsanto, Christopher, et al. "Composing software defined networks." Presented as part of the 10th USENIX Symposium on Networked Systems Design and Implementation (NSDI 13). 2013.

WEB LINKS:

1. <https://www.geeksforgeeks.org/software-defined-networking/>
2. <https://www.howtoforge.com/tutorial/software-defined-networking-sdn-explained-for-beginners/>

SEMESTER-III
SOFTWARE PROJECT MANAGEMENT
(THEORY)

4H-4C

Instruction Hours/week: L:4 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To design, select and apply the most appropriate software engineering process for developing any software project
- To implement planning for software project and identify the risks in software planning.
- To analyze the software requirements for developing any software.
- To understand the importance of negotiation, effective work habits, leadership in software development process.
- To identify the risks involved in software project management

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Implement the concept of software effort estimation in developing software project.	Apply
CO2	Develop a responsible attitude towards the use of computer as well as the technology.	Apply
CO3	Evaluate the risks during the development of software projects	Understand
CO4	Understand the organization behavior in software project management.	Apply
CO5	Implement team management process in developing quality software	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M	S		L							
CO2												
CO3			S	L				M	S	M		
CO4	M			M							L	M
CO5				S								

S-Strong; M-Medium; L-Low

UNIT I – Introduction**9 HOURS**

Software Project Management -Project evaluation and program Management- An overview of Project planning- Stepwise Planning-Selection of an appropriate project Approach.

UNIT II - Software Effort Estimation**9 HOURS**

Problems with over- and underestimates-Software effort estimation Techniques - Estimating by analogy -Albrecht function point analysis -Function points Mark II – COSMIC full function points - COCOMO 13: a parametric productivity model. Activity planning: The objectives of activity Planning-Project schedules - Projects and activities - Sequencing and scheduling activities - Network planning models - Formulating a network model - Adding the time dimension - The forward pass - The backward pass - Identifying the critical path.

UNIT III - Risk management**10 HOURS**

Introduction to Risk - Categories of risk - A framework for dealing with risk -Risk identification - Risk assessment - Risk planning - Risk management - Evaluating risks to the schedule - Applying the PERT technique - Monte Carlo simulation - Critical chain concepts. Resource allocation: -Introduction -The nature of resources - Identifying resource requirements - Scheduling resources -Creating critical paths -Counting the cost - Being specific -Publishing the resource schedule - Cost schedules -The scheduling sequence.

UNIT IV - Monitoring and control**10 HOURS**

Creating the framework-Collecting the data- Visualizing progress- Cost monitoring - Earned value analysis-Prioritizing monitoring - Getting the project back to target - Change control. Managing people in software environments: Understanding behavior - Organization behavior: a background - Selecting the right person for the job - Instruction in the best methods – Motivation - Stress -Health and safety -Some ethical and professional concern

UNIT V - Working in Teams**10 HOURS**

Becoming a team - Decision making - Organizational structures - Coordination dependencies - Dispersed and virtual teams - Communication genres -Communication plans - Leadership. Software quality: Introduction -The place of software quality in project planning - The importance of software quality - Defining software quality - ISO 9126 -Product versus process quality management -Quality management systems - Process capability models -Techniques to help enhance software quality -Testing -Quality plans and software testing tools.

SUGGESTED BOOKS

1. Kelkar, 2012. “Software Project Management”, 3rd edition, Prentice Hall India
2. Bob Hughes and Mike Cotterell, 2011. Software Project Management, 5th Edition, NewDelhi: Tata McGraw Hill
3. Royce, 2000, Software Project Management, 1st Edition, New Delhi: AddisonWesley.

WEB LINKS:

1. http://en.wikipedia.org/wiki/Software_project_management
2. <http://www.onesmartclick.com/engineering/software-engineering.html>
3. http://www.cc.gatech.edu/classes/AY2000/cs3802_fall/
4. <https://www.classcentral.com/course/swayam-software-project-management-14294>

NPTEL

1. <https://nptel.ac.in/courses/106105218/>
2. https://swayam.gov.in/nd1_noc19_cs70/preview

SEMESTER-III
WEB DESIGN USING WORDPRESS
(THEORY)

4H-4C

Instruction Hours/week: L:4 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- Acquire knowledge of the creative uses of web site and interface design
- Acquire skills in the use of the tools and techniques available in a web design software program using WordPress
- Communicate visual concepts through the appropriate choice and application of composition, type styles, images, interface design, and interactively
- Demonstrate the development of visual and conceptual skills required to create a successful design solution through the process of idea development, refinement, and assessment in the creation of design projects
- Effectively communicate an understanding of design concepts, processes, and techniques, using the “language” of design

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Identify and apply the design principles to control aesthetic and compositional elements in the creation of visual solutions to art and design problems	Apply
CO2	Understand the function and impact of design, and the roll of the design profession in our society	Understand
CO3	Be able to analyze a visual communication problem, develop visual concepts, and create design solutions that respond to client	Analyze
CO4	Acquire skills in the use of image scanning, page layout, and vector and raster image software programs	Apply
CO5	Understand project management, marketing, and business-related responsibilities of a graphic designer	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M	M	M				M	M	M		
CO2		S								S	M	
CO3		M					M	L				
CO4	M											
CO5		M	S	L					S	L	M	

S-Strong; M-Medium; L-Low

UNIT I - Introduction to Web Design**9 HOURS**

Overview of web design- Linear vs. non-linear (interactive) design- Introduction to web pages- their purpose- Working with a web browser- Analysing different kinds of website designs.

Design issues in web page design: Function and purpose- Content. Visuals- Interface design – Interactivity.

Web design process -Define content - Time line - Budget and resources.

UNIT II - Visual Design**9 HOURS**

Visuals – format-type- image -color scheme

Interface and interaction: Organizing and grouping content -Screen layout -Menus and navigation.

UNIT III - Introduction to WordPress**10 HOURS**

WordPress introduction and overview: Creating an account - managing your account- WordPress interface-menus - dashboard - file structure -upgrading. WordPress settings: General -text -media- links. Site design: menus-categories -navigation -headers-links - color scheme -fonts choices - layout options. Platform adaptation: design for desktop - design for mobile. Themes and templates: choose a theme - customize a theme - working with templates.

UNIT IV - Widgets and plugins**10 HOURS**

Widgets and plugins: adding widgets - adding plugins. Website content: posts -pages - tags. Menus: add menus - edit menus. Media: edit images -create and manage galleries - audio -video -Customize a Wordpress theme.

UNIT V- Blog**10 HOURS**

Blogs: setting up a blog -posting to a blog -manage a blog- search engine optimization- sitemaps - tracking site statistics-Updating a website-Graphics software for creating web page images and graphics-Photoshop functions and techniques specific to web page design -Illustrator functions and techniques specific to web page design -Image scanning -Copyright laws and how they apply to art and design -Portfolio presentation.

SUGGESTED BOOKS

1. Visual Quick Start Guide—WordPress, PeachPit
2. WordPress for Beginners 2019: A Visual Step-by-Step Guide to Mastering WordPress, Andy Williams, 2018
3. WordPress Plugin Development Cookbook, Yannick Lefebvre, 2017.
4. WordPress 4.0 Site Blueprints 2nd Edition: Build Your Own Website Using Best Practices, Rachel McCollin.
5. WordPress 5 Complete: Build beautiful and feature-rich WEB LINK from scratch, 7th Edition, Karol Krol

WEB LINKS:

1. <https://www.tutorialspoint.com/wordpress/index.htm>
2. <https://learn.wordpress.org/tutorials>
3. <https://learn.wordpress.org>
4. <https://www.w3schools.in/wordpress>
5. <https://wordpress.com/learn>

SEMESTER-III
DATA PREPROCESSING AND VISUALIZATION
(THEORY)

4H-4C

Instruction Hours/week: L:4 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To know the importance of data Visualization in the world of Data Analytics and Prediction
- To know the important libraries in Tableau
- To create charts using Tableau Tool
- To aggregate data using Tableau Tool
- To visualize data as maps and forecast future data using Tableau Tool

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Visualize data through seven stages of data analysis process	Apply
CO2	Explore hybrid types of data visualization	Apply
CO3	Understand various stages of visualizing data	Understand
CO4	Create charts using Tableau Tool	Apply
CO5	Aggregate data using Tableau Tool	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M				M	M	M				
CO2								S	M			
CO3					M	L					L	
CO4												
CO5	S	L					S	L	M			L

S-Strong; M-Medium; L-Low

UNIT I-Creating Visual Analytics with tableau**9 HOURS**

Creating Visual Analytics with tableau desktop, connecting to your data-How to Connect to your data, what are generated Values? Knowing when to use a direct connection, joining tables with tableau, blending different data sources in a single worksheet.

UNIT II-Building your first Visualization**9 HOURS**

Building your first Visualization- How Me works- Chart types, Text Tables, Maps, bar chart, Line charts, Area Fill charts and Pie charts, scatter plot, Bullet graph, Gantt charts, Sorting data in tableau, Enhancing Views with filters, sets groups and hierarchies.

UNIT III-Creating calculations**10 HOURS**

Creating calculations to enhance your data- What is aggregation, what are calculated values and table calculations, Using the calculation dialog box to create, Building formulas using table calculations, Using table calculation functions

UNIT IV-Using maps to improve insights**10 HOURS**

Using maps to improve insights-Create a Standard Map View, Plotting your own locations on a map, Replace Tableau's standard maps, Shaping data to enable Point-to-Point mapping.

UNIT V-Developing an Adhoc analysis**10 HOURS**

Developing an Adhoc analysis environment- generating new data with forecasts, providing self-evidence adhoc analysis with parameters, Editing views in tableau Server.

SUGGESTED BOOKS

1. Joshua N. Millign, 2019. "Learning Tableau", Third Edition- Packt publications Student Activity
2. Cole Nussbaumer Knaflie ,2014. "Storytelling with Data: A Data Visualization Guide for Business Professionals
3. Noah Iliinsky, Julie Steele , 2011, Designing Data Visualizations: Representing Informational Relationships
4. Ashutosh Nandeshwar, 2009, "Tableau Data Visualizaton Cookbook", PACKT publishing.
5. Hadley Wickham , 2009, ggplot2: Elegant Graphics for Data Analysis
6. Alexandru C. Telea , 2007. "Data Visualization principles and practice" Second Edition, CRC Publications

WEB LINKS:

1. <https://www.tableau.com/>
2. <https://www.tutorialspoint.com/tableau/index.htm>
3. <https://www.coursera.org/specializations/data-visualization>
4. <https://towardsdatascience.com/tableau-visualizations>

SEMESTER-III
BIG DATA ANALYTICS
(THEORY)

4H-4C

Instruction Hours/week: L:4 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To understand the evolution and architecture of Big Data
- To learn the virtualization concept of big data
- To learn the Hadoop framework in processing big data
- To understand the concepts of big data analytics
- To define the concept of data source integration for big data processing

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Analyze the big data analytic techniques for useful business applications.	Apply
CO2	Implement the concept of virtualization and abstraction in analyzing big data	Apply
CO3	Analyze the HADOOP and Map Reduce technologies associated with big data analytics	Understand
CO4	Understand the fundamentals of various big data analysis techniques	Apply
CO5	Implement the integration of data sources in operationalizing Big Data	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M		M				M		M		M
CO2		S	M							S	M	
CO3							M	L				
CO4												
CO5	S	L	M	L						L	M	L

S-Strong; M-Medium; L-Low

UNIT I - Fundamentals of Big Data**9 HOURS**

The Evolution of Data Management Understanding the Waves of Managing Data-Defining BigData - Big Data Management Architecture- The Big Data Journey -Big Data Types-Defining Structured Data-Defining Unstructured Data-Putting Big Data Together.

UNIT II - Big Data Stack**9 HOURS**

Basics of Virtualization - The importance of virtualization to big data -Server virtualization - Application virtualization - Network virtualization -Processor and memory virtualization - Data and storage virtualization

UNIT III – Hadoop**10 HOURS**

Hadoop - Hadoop Distributed File System - Hadoop MapReduce- The Hadoop foundation andEcosystem.

UNIT IV - Big Data Analytics**10 HOURS**

Big Data Analytics-Text Analytics and Big Data-Customized Approaches for Analysis of Big Data.

UNIT -V - Integrating Data Sources**10 HOURS**

Integrating Data Sources-Real-Time Data Streams and Complex Event Processing-Operationalizing Big Data.

SUGGESTED BOOKS

1. Michael Minelli, Michele Chambers, Ambiga Dhiraj, 2013. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Wiley Publications, New Delhi.
2. Judith Hurwitz, Alan Nugent, Fern Halper, Marcia Kaufman, 2013. Big Data For Dummies, Wiley India, New Delhi.
3. Paul Zikopoulos, Dirk deRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, 2012. Harness the Power of Big Data The IBM Big Data Platform, Tata McGrawHill Publications, New Delhi.
4. Zikopoulos, Paul, Chris Eaton, 2011. Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, Tata McGraw Hill Publications, New Delhi.

WEB LINKS:

1. www.oracle.com/bigdata
2. www.planet-data.eu/sites/default/files/Big_Data_Tutorial_part4.pdf
3. www.ibm.com/developerworks/data
4. www.solacesystems.com
5. en.wikipedia.org/wiki/Big_data
6. www.sap.com/solution/big-data.html

NPTEL

1. <https://nptel.ac.in/courses/110106072/>
2. <https://nptel.ac.in/courses/110106064/>

SEMESTER-III
WIRELESS SENSOR NETWORKS
(Theory)

4H-4C

Instruction Hours/week: L:4 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To understand the basics of Ad-hoc & Sensor Networks
- To learn various fundamental and emerging protocols of all layers in ad-hoc network
- To study about the issues pertaining to major obstacles in establishment and efficient management of ad-hoc and sensor networks
- To understand the nature and applications of ad-hoc and sensor networks
- To understand various security practices and protocols of Ad-hoc and Sensor Networks

Course Outcomes

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

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

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M		M							
CO2			S	M				M		M		
CO3								S	M			
CO4	M											
CO5			L	M	L							

S-Strong; M-Medium; L-Low

UNIT I - Ad hoc Networks Fundamentals & Communication Protocols 9 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 – Solutions for TCP Over Ad-Hoc Networks

UNIT II - Ad hoc Network Routing and Management 9 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

UNIT IV - Sensor Network Management and Programming 10 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.

UNIT V - Ad hoc and Sensor Network Security 10 HOURS

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

SUGGESTED BOOKS

1. Khan Shafiullah Et.Al, September 2021. "Wireless Sensor Networks Current status and Future Trends", Taylor & Francis, , ISBN: 9781138582712
2. Rohtash Ghuriya, April 2015. "Wireless AdHoc and Sensor Networks", Gazelle Book Services, , ISBN: 9789380090733
3. Carlos De Moraes 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", Pearson Education,.
5. Teieb Znati Kazem Sohraby, Daniel Minoli, 2010. "Wireless Sensor Networks: Technology, Protocols and Applications, Wiley, ISBN: 13 978-8126527304
6. Waltenegus Dargie, Christian Poellabauer, 2010. "Fundamentals of Wireless Sensor Networks Theory and Practice", John Wiley and Sons,
7. Amiya Nayak, Ivan Stojmenovic, 2010. "Wireless Sensor and Actuator Networks: Algorithm and Protocols for Scalable Coordination and Data communication", John Wiley & Sons

8. Erdal Çayırıcı, Chunming Rong, 2009. “Security in Wireless AdHoc and Sensor Networks”, John Wiley and Sons
9. Subir Kumar Sarkar, T G Basavaraju, C Puttamadappa, 2008. Ad Hoc Mobile Wireless Networks, Auerbach Publications,.
10. C.K.Toh, 2007. “AdHoc Mobile Wireless Networks”, Pearson Education,
11. Holger Karl, Andreas willing, 2007. “Protocols and Architectures for Wireless Sensor Networks”, John Wiley & Sons,Inc..

WEB LINKS:

1. [www.winlab.rutgers.edu › ~crose › dimacs03 › kumar](http://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/victerpaul/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](https://www.mooc-list.com/course/wireless-communication-emerging-technologies-coursera)

NPTEL

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

SEMESTER-III
SOFTWARE METRICS
(THEORY)

4H-4C

Instruction Hours/week: L:4 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To understand the basic terminology and state fundamental facts about software metrics and process models.
- To identify the essential elements of a given metric or model, describe the interrelationships among its various elements
- To understand software process assessment cycles, complexity metrics and models.
- To measure and analyze customer satisfaction in development of software
- To know the techniques to improve the software process development

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	To analyze the importance of modeling and modeling languages	Analyze
CO2	To apply the basic quality tools in software development	Apply
CO3	Analyze the software process metrics in the process of software testing	Analyze
CO4	Implement function point metrics to measure software process improvement	Apply
CO5	Assess the software project using the metrics	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M					M						
CO2						S					S	M
CO3	M	S	M						S	M	L	
CO4	S						M				M	L
CO5	M	S	M			M	L					

S-Strong; M-Medium; L-Low

UNIT I – Introduction**9 HOURS**

Software quality-popular views-the role of the customer-software quality- Total quality management. Software development process models-the spiral model-iterative development process-The Cleanroom Methodology-Process Maturity Framework and Quality standards. Fundamentals of Measurement Theory-Level of measurement-Reliability and validity- Measurement Errors

UNIT -II - Applying the seven basic quality tools**9 HOURS**

Applying the seven basic quality tools in software development-Defect removal effectiveness- The Rayleigh Model-Exponential distribution and reliability growth models-Quality managementmodels

Unit-III - Process metrics for software testing**10 HOURS**

Process metrics for software testing-Complexity metrics and models-Metrics and lessons learnedfor object-oriented projects-Availability metrics

UNIT-IV - Measuring and analyzing**10 HOURS**

Measuring and analyzing customer satisfaction-Conducting in-process quality assessments

UNIT-V - Software project assessments**10 HOURS**

Software project assessments-Dos and Don'ts of software process improvement-Using functionpoint metrics to measure software process improvement-Concluding remarks

SUGGESTED BOOKS

1. Norman Fenton, 2014, Software Metrics: A Rigorous and Practical Approach, Third Edition (Chapman & Hall/CRC Innovations in Software Engineering and SoftwareDevelopment Series)
2. Stephen H.Kan, 2013. Metrics and Models in Software Quality Engineering, Second Edition, Pearson India.
3. C. Ravindranath Pandian, 2003. Software Metrics: A Guide to Planning, Analysis, and Application,

WEB LINKS:

1. <https://www.digimat.in/nptel/courses/video/106101061/L21.html>

NPTEL

1. <http://www.nptelvideos.in/2012/11/software-engineering.html>

SEMESTER-III
INTERNET OF THINGS
(THEORY)

4H-4C

Instruction Hours/week: L:4 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- 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
- To Know the various applications of IoT
- To integrate the IoT in various applications

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Understand building blocks of Internet of Things and characteristics.	Understand
CO2	Understand IoT protocols, Web of Things and Integrating IOT.	Understand
CO3	Understand the application areas of IOT .	Understand
CO4	Learn the various cloud service providers	Apply
CO5	Realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M										
CO2		S					S	M				
CO3					S	M	L				S	M
CO4			M				M	L		M	L	
CO5		M	L								M	L

S-Strong; M-Medium; L-Low

UNIT I – Introduction**9 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**9 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 – Network layer – APS layer – Security.

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. Cloud of Things: Grid/SOA and Cloud Computing – Cloud Middleware – Cloud Standards – Cloud Providers and Systems – Mobile Cloud Computing – The Cloud of Things Architecture.

UNIT IV - Integrating IoT**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**10 HOURS**

The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments - Resource Management in the Internet of Things: Clustering, Synchronization and Software Agents. Applications - Smart Grid – Electrical Vehicle Charging Domain Specific IoT: Home Automation-Agriculture-Health and Lifestyle monitoring system-Cities-Smart Parking-Smart Roads-Surveillance. Industry: Machine Diagnosis-Indoor Air Quality Monitoring System.

SUGGESTED BOOKS

1. Olivier Hersent, Omar Elloumi and David Boswarthick, 2012. The Internet of Things: Applications to the Smart Grid and Building Automation . Wiley.
2. Olivier Hersent, David Boswarthick, Omar Elloumi, 2012. The Internet of Things – Keyapplications and Protocols. Wiley.
3. Honbo Zhou, 2012. The Internet of Things in the Cloud: A Middleware Perspective—CRCPress .
4. Dieter Uckelmann; Mark Harrison; Florian Michahelles- (Eds.), 2011. Architecting theInternet of Things– Springer.
5. David Easley and Jon Kleinberg , 2010. Networks, Crowds, and Markets: Reasoning About a Highly Connected World , Cambridge University Press.

WEB LINKS:

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>

NPTEL

1. <https://nptel.ac.in/courses/106105166/>
2. <https://nptel.ac.in/courses/106105195/>
3. https://swayam.gov.in/nd1_noc19_cs65/preview

SEMESTER-III
DEEP LEARNING
(THEORY)

4H-4C

Instruction Hours/week: L:4 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To understand the basic ideas and principles of Neural Networks
- To design the feed forward neural networks for real world problems
- To apply the concept of CNN for image classification
- To apply RNN methods for image classification using the tools like TensorFlow and Keras
- To appreciate the use of Deep Learning models for real world Applications

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Understand the basic ideas and principles of Neural Networks	Understand
CO2	Apply feed forward neural networks for real world problems.	Apply
CO3	Analyze different deep learning models in Image related projects.	Analyze
CO4	Design and implement deep learning applications using RNN.	Apply
CO5	Understand the role of deep learning in machine learning applications and get familiar with the use of TensorFlow/Keras in deep learning applications.	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M										
CO2		S					S	M			S	M
CO3	M	L			S				S	M		
CO4			M				M	L			M	L
CO5		M	L									

S-Strong; M-Medium; L-Low

UNIT I- Introduction to Neural Networks**9 HOURS**

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

UNIT II- Feed Forward Neural Networks**9 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**

Nestors 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.

UNIT V- Case Studies Using CNN & RNN**10 HOURS**

Attention Models for Computer Vision – Case Study: Named Entity Recognition – Opinion Mining using Recurrent Neural Networks – Parsing and Sentiment Analysis using Recursive Neural Networks – Sentence Classification using Convolutional Neural Networks – Dialogue Generation with LSTMs.

SUGGESTED BOOKS

1. Francois Chollet. 2018. Deep Learning with Python, Manning Publications, First Edition.
2. Ragav Venkatesan, Baoxin Li. 2018. Convolutional Neural Networks in Visual Computing, CRC Press, First Edition.
3. Navin Kumar Manaswi. 2018. Deep Learning with Applications Using Python, A press, First Edition.
4. Phil Kim. 2017. Matlab Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence, A Press, Third Edition.
5. Ian Good Fellow, Yoshua Bengio and Aaron Courville. 2017. Deep Learning, MIT Press, First Edition.
6. Joshua F. Wiley. 2016. Deep Learning Essentials, Packt Publications, First Edition.

WEB LINKS:

1. www.ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-s191-introduction-to-deep-learning-january-iap-2020/
2. www.kaggle.com/learn/intro-to-deep-learning

NPTEL

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/

SEMESTER-III
MACHINE LEARNING WITH PYTHON-PRACTICAL
(PRACTICAL)

4H-2C

Instruction Hours/week: L:4 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

Course Objectives

- Define the types and theory of machine learning.
- Describe the classification models of machine learning
- Explain the techniques of distance-based models of machine learning
- Examine the various tree based and rule-based models of machine learning
- Demonstrate the concept of reinforcement learning for game playing

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Develop python-based applications for regression and classifications	Apply
CO2	Implement Data preprocessing techniques	Apply
CO3	Create Bayesian Models	Apply
CO4	Analyze the concept of neural networks	Analyze
CO5	Design the application using python for Neural networks for text	Create

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S				S			M				
CO2	L	M	L	S	M					M		
CO3							L			S		
CO4				L			M				L	S
CO5				S	S						M	M

S-Strong; M-Medium; L-Low

List of Programs**48 HOURS**

1. Write a python program to implement Linear regression.
2. Write a python program to implement Linear Classification
3. Write a python program to implement Kernelizations.
4. Write a python program to implement Model selection
5. Write a python program to implement Ensembles
6. Write a python program to implement Data preprocessing
7. Write a python program to implement Bayesian models.
8. Write a python program to implement neural networks
9. Write a python program to implement Convolutional neural nets
10. Write a python program to implement Neural networks for text.

SUGGESTED BOOKS

1. Kenneth. A. Lambert, 2019. “Fundamentals of Python First Programs”, 2nd Edition, Cengage.
2. Allen Downey, 2019. “Think Python”, 2nd edition, Green Tea Press.
3. Vamsi Kurama, 2018. “Python Programming: A Modern Approach”, 1st edition, Pearson Publishers.
4. Ashok Namdev Kamthane, Amith Ashok Kamthane, 2016. “Programming and Problem Solving with Python”, 1st Edition, McGraw Hill Education.
5. W.J. Chun, 2013. “Core Python Programming”, 3rd Edition, Pearson publishers.

WEB LINKS:

1. <https://www.programiz.com/python-programming>
2. <https://www.learnpython.org/>
3. <http://docs.python.org/3/tutorial/index.html>
4. https://www.w3schools.com/python/python_try_except.asp
5. <https://www.tutorialspoint.com/turtle-graphics-using-python>

SEMESTER-III
.NET PROGRAMMING-PRACTICAL
(PRACTICAL)

4H-2C

Instruction Hours/week: L:0 T:0 P:4 Marks: Internal:40 External:60 Total:100
End Semester Exam: 3 Hours

Course Objectives

- To Create windows forms using arrays and flow control statements.
- To Learn to use the classes and namespaces in the .NET Framework class library.
- To Develop Web Applications using Microsoft ASP.NET programming.
- To Learn to use Basic windows controls using Visual Basic.Net
- To Understand the concept of Multiple Document Interface

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Develop Windows based applications using Visual Basic.Net	Apply
CO2	Implement ADO.Net concept in VB.Net and ASP.Net applications	Apply
CO3	Create server side web applications using ASP.NET	Apply
CO4	Analyze the concept of data sources and data bound controls in VB.NET and ASP.NET	Analyze
CO5	Design the application using ASP.NET Web Server Control	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M		S	M				M	L		
CO2					M					M		
CO3	M	M	S				L			L		M
CO4					M		M				M	
CO5	S	M	M	S	S						M	

S-Strong; M-Medium; L-Low

List of Programs

48 HOURS

VB.Net

1. Develop a program which makes use of String and String Builder class.
2. Develop a VB.NET application to perform Treeview operation
3. Develop a VB.NET application using menu
4. Create an application using Common Dialog Controls.
5. Write a program for Databinding using datalist control.
6. Write a program to demonstrate insert, delete and update operations using ADO.Net Code.

ASP.Net

1. Write a program to create an on-line quiz using content page holder.
2. Write a program to retrieve Cookies information.
3. Write a program to count web page hits.
4. Create an ASP page to accept customer details and post the data into the database and perform edit, delete and view the customer information at any point of time.
5. Write program to retrieve environment variables browser capability information.
6. Write a program for database connectivity to retrieve student information

SUGGESTED BOOKS

1. Shirish Chavan. 2007. Visual Basic.Net, 1st Edition, Pearson Education, New Delhi.
2. Duncan Mackenzie Kent Sharkey, 2006. Sams Teach yourself Visual Basic.JNet, 1st Edition, McGraw Hill, New Delhi.
3. Bill Evjen, Scott Hanselman, Devin Rader, Farhan Muhammad and S.Srinivasa Sivakumar, 2006. Professional ASP.net 2.0, Special Edition.
4. Evangelos Petroustos, 2005. Mastering Visual Basic.Net, BPB Publications, New Delhi.
5. Dave Mercer, ASP.Net Beginner's Guide, 2003. 2nd Edition McGraw Hill, New Delhi.

WEB LINKS:

1. <https://www.w3resource.com/csharp-exercises/>
2. <https://www.guru99.com/asp-net-tutorial.html>
3. <https://www.oreilly.com/library/view/net-programming-a/0130669458/>

SEMESTER-III

**DATA MINING AND DATA WAREHOUSING-PRACTICAL
(PRACTICAL)**

3H-2C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

Course Objectives

- To gain the knowledge of the concepts and techniques in data mining
- To understand the data mining functionalities and pattern classification.
- To understand the cleaning and clustering process of data mining.
- To gain the knowledge of data warehouse architecture in data mining process
- To know about the Multimedia database

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	To understand the data mining process of voluminous data using OLAP	Understand
CO2	To implement the preprocessing concept in data mining applications	Implement
CO3	To apply the data mining algorithms on big data to extract useful data	Apply
CO4	To implement data mining techniques for complex data types	Apply
CO5	To implement Decision Support System concept in data mining for developing intelligence business applications	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	L	S		L				M	L	
CO2	L	M	M	L						S	M	
CO3	M	L	S	M				S		L	S	M
CO4	M			L		S	M	M				L
CO5	S			S			L	L				S

S-Strong; M-Medium; L-Low

List of Programs

36 HOURS

1. Use the following learning schemes, with the default settings to analyze the weather data(in weather.arff). For test options, first choose "Use training set", then choose "PercentageSplit" using default 66% percentage split. Report model percent error rate
2. Using iris dataset preprocess and classify it with J4.8 and Naïve Bayes Classifier.examinethe tree in the Classifier output panel
3. Using the datasets *ReutersCorn-Train* and *ReutersGrain-Train*. Classify articles using binary attributes and word count attributes.
4. Apply any two association rule based algorithm for the supermarket analysis
5. Using weka Experimenter perform comparison analysis of J48, oneR and ID3 for votedataset
6. Using Weka Experimenter perform comparison analysis of Naïve Bayes with differentdatasets
7. Apply ZeroR, OneR, and J48, to classify the Iris data in an experiment using 10 train andtest runs, with 66% of the data used for training and 34% used for testing.
8. Using Weka Knowledge flow Sett up a flow to load an ARFF file (batch mode) and perform a cross-validation using J48 (WEKA's C4.5 implementation).
9. Draw multiple ROC curves in the same plot window, using J48 and RandomForest asclassifiers.
10. Use any three clustering algorithm on Vehicle data set and find best among them
11. Perform Preprocessing, feature selection and apply any one of the algorithm each fromclustering, Association and classification to find their performance
12. Examine the performance of different filters for the breast cancer dataset

SUGGESTED BOOKS

1. Jiawei Han and Micheline Kamber, 2011. Data Mining Concepts and Techniques, 3rdEdition, Elsevier,India (Unit I, III, IV, V)
2. Paulraj Ponniah, 2008. Data Warehousing Fundamentals: A Comprehensive Guide forIT Professionals, John Wiley & Sons, New Delhi.
3. G.K.Gupta, 2006, Introduction to Data Mining with Case Studies, Prentice Hall India,New Delhi (Unit – IV)
4. Soman.K.P, Shyam Divakar and V. Ajay, 2008. Insight to Data Mining-Theory andPractical, Prentice Hall India, New Delhi. (Unit – II).
5. Gupta.G.K., 2006. Introduction to Data Mining with Case Studies, Prentice Hall India,New Delhi .

WEB LINKS:

1. www.wikipedia.org/wiki/Data_mining
2. www.anderson.ucla.edu/faculty/jason.frand/teacher/technologies/palace/datamin ing.ht
3. www.thearling.com/text/dmwhite/dmwhite.htm

SEMESTER-III
SOFTWARE DEFINED NETWORK USING NS3-PRACTICAL
(PRACTICAL)

3H-2C

Instruction Hours/week: L:0 T:0 P:3 Marks: Internal:40 External:60 Total:100
End Semester Exam: 3 Hours

Course Objectives

- To learn the fundamentals of software defined networks.
- To understand the separation of the data plane and the control plane.
- To study about the SDN Programming.
- To study about the various applications of SDN
- To analyse the expected future of SDN applications

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	To understand the basics of Mininet	Understand
CO2	To implement the concept of Legacy Networks	Implement
CO3	To understand how to configure SDN Network	Understand
CO4	To implement OpenFlow Protocol Management	Implement
CO5	To understand Configuring Virtual Private LAN Service (VPLS)	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	L	S	M			L	M			
CO2				L	M		S				L	M
CO3			S	M				L	M	S	M	
CO4	M	L		L	M		M	S			L	M
CO5	S		M	S						M	S	

S-Strong; M-Medium; L-Low

List of Programs

36 HOURS

1. Introduction to Mininet
2. Legacy Networks: BGP Example as a Distributed System and Autonomous Forwarding Decisions
3. Early Efforts of SDN: MPLS Example of a Control Plane that Establishes Semi-static Forwarding Paths
4. Introduction to SDN- SDN Network Configuration
2. Configuring VXLAN to Provide Network Traffic Isolation
3. OpenFlow Protocol Management
4. Routing within an SDN network
5. Incremental Deployment of SDN Networks within Legacy Networks
6. Configuring Virtual Private LAN Service (VPLS)
7. Applying Equal-cost Multi-path Protocol (ECMP) within SDN networks

SUGGESTED BOOKS

1. Software Defined Networks: A Comprehensive Approach by Paul Goransson and Chuck Black, Morgan Kaufmann Publications, 2014
2. SDN - Software Defined Networks by Thomas D. Nadeau & Ken Gray, O'Reilly, 2013
3. Software Defined Networking with OpenFlow By SiamakAzodolmolky, Packt Publishing, 2013
4. Feamster, Nick, Jennifer Rexford, and Ellen Zegura. "The road to SDN: an intellectual history of programmable networks." ACM SIGCOMM Computer Communication Review 44.2 (2014): 87-98.
5. Kreutz, Diego, et al. "Software-defined networking: A comprehensive survey." Proceedings of the IEEE 103.1 (2015): 14-76.
6. Nunes, Bruno AA, et al. "A survey of software-defined networking: Past, present, and future of programmable networks." Communications Surveys & Tutorials, IEEE 16.3 (2014): 1617-1634.
7. Lantz, Bob, Brandon Heller, and Nick McKeown. "A network in a laptop: rapid prototyping for software-defined networks." Proceedings of the 9th ACM SIGCOMM Workshop on Hot Topics in Networks. ACM, 2010.
8. Monsanto, Christopher, et al. "Composing software defined networks." Presented as part of the 10th USENIX Symposium on Networked Systems Design and Implementation (NSDI 13). 2013.

WEB LINKS:

1. <https://www.geeksforgeeks.org/software-defined-networking/>
2. <https://www.howtoforge.com/tutorial/software-defined-networking-sdn-explained-for-beginners/>

SEMESTER-III

**SOFTWARE DEVELOPMENT PRACTICAL USING MOODLE-PRACTICAL
(PRACTICAL)**

3H-2C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

Course Objectives

- Design, select and apply the most appropriate software engineering process for developing any software project
- Implement planning for a software project
- Identify the risks in software planning.
- Analyze the software requirements for developing any software.
- Understand the importance of negotiation, effective work habits, leadership in the software development process.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	To implement the concept of software effort estimation in developing software project.	Apply
CO2	Develop a responsible attitude towards the use of computer as well as the technology .	Implement
CO3	Evaluate the risks during the development of software projects	Analyze
CO4	Understand the organization behavior in software project management.	Understand
CO5	To implement team management process in developing quality software	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S		M	M	L			M	S	M	M	L
CO2	L		M		M							
CO3	M			S	L		M	L		M	S	M
CO4	M		L	M								
CO5	S		M		S			M	L			

S-Strong; M-Medium; L-Low

List of Programs**36 HOURS**

Prepare a more detailed, organized and easy-to-read documentation, for any application software, which should describe the following using Moodle tool:

1. User Requirement Documentation (USD)
2. Requirement Analysis Documentation. (RAD)
3. User Interfaces Specification. (UIS)
4. Object Oriented Design (OOD) or Low Level Design (LLD)
5. Code Documentation (CD)
6. Testing Documentation (TD)
7. User's Guide (UG)

SUGGESTED BOOKS

1. Bob Hughes and Mike Cotterell (2011), Software Project Management, 5th Edition, New Delhi: Tata McGraw Hill
2. Royce.(2000), Software Project Management, 1st Edition, New Delhi: Addison's Wesley.
3. Kelkar (2012), "Software Project Management", 3rd edition, Prentice Hall India,2012

SEMESTER-III
WEB DESIGN USING WORDPRESS-PRACTICAL
(PRACTICAL)

3H-2C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

Course Objectives

- Acquire knowledge of the creative uses of web site and interface design
- Acquire skills in the use of the tools and techniques available in a web design software program using WordPress
- Communicate visual concepts through the appropriate choice and application of composition, type styles, images, interface design, and interactively
- Demonstrate the development of visual and conceptual skills required to create a successful design solution through the process of idea development, refinement, and assessment in the creation of design projects
- Effectively communicate an understanding of design concepts, processes, and techniques, using the “language” of design

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	To design a website using various GUI components	Apply
CO2	Understand the development of creating a post	Understand
CO3	To develop a template for a theme	Analyze
CO4	Acquire skills in installing Google Analytics	Understand
CO5	Understand to create a dynamic site static using a content CDN	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	L				L		M			M
CO2			M						S			L
CO3				M			M	L			M	
CO4	M			L							S	
CO5	S		M	S	S					M	L	S

S-Strong; M-Medium; L-Low

List of Programs**36 HOURS**

1. Create a website using Wordpress
2. Create a post in wordpress.
3. Create a landing page template for a theme
4. Install Google Analytics in WordPress
5. Add icons to custom menus without plugins
6. Build a client portal with WordPress
7. Override styles in WordPress
8. Hide your login page from hackers
9. Make a dynamic site static using a content CDN
10. Build a blog using the WordPress API

SUGGESTED BOOKS

1. Visual Quick Start Guide—WordPress, PeachPit
2. WordPress for Beginners 2019: A Visual Step-by-Step Guide to Mastering WordPress, Andy Williams, 2018
3. WordPress Plugin Development Cookbook, Yannick Lefebvre, 2017.
4. WordPress 4.0 Site Blueprints 2nd Edition: Build Your Own Website Using Best Practices, Rachel McCollin.
5. WordPress 5 Complete: Build beautiful and feature-rich WEB LINK from scratch, 7th Edition, Karol Krol

WEB LINKS:

1. <https://www.tutorialspoint.com/wordpress/index.htm>
2. <https://learn.wordpress.org/tutorials>
3. <https://learn.wordpress.org>
4. <https://www.w3schools.in/wordpress>
5. <https://wordpress.com/learn>

SEMESTER-III
DATA VISUALIZATION -PRACTICAL
(PRACTICAL)

3H-2C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam: 3 Hours

Course Objectives

- To know the importance of data Visualization in the world of Data Analytics and Prediction
- To know the important libraries in Tableau
- To create charts using Tableau Tool
- To aggregate data using Tableau Tool
- To visualize data as maps and forecast future data using Tableau Tool

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Visualize data through seven stages of data analysis process	Analyze
CO2	Explore hybrid types of data visualization	Analyze
CO3	Understand various stages of visualizing data	Understand
CO4	Create charts using Tableau Tool	Apply
CO5	Aggregate data using Tableau Tool	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				S				L		M		
CO2				M						S		
CO3	M							M	L			M
CO4	M	L										S
CO5	S	M										

S-Strong; M-Medium; L-Low

List of Programs**36 HOURS**

1. Connect to data Sources
2. Create Univariate Charts
3. Create Bivariate and Multivariate charts
4. Create Maps
5. Calculate user-defined fields
6. Create a workbook data extract
7. Save a workbook on a Tableau server and web
8. Export images, data.

SUGGESTED BOOKS

1. Joshua N. Millign, 2019. “Learning Tableau ”, Third Edition- Packt publications Student Activity
2. Cole Nussbaumer Knaflie ,2014. “Storytelling with Data: A Data Visualization Guide for Business Professionals
3. Noah Iliinsky, Julie Steele , 2011, Designing Data Visualizations: Representing Informational Relationships
4. Ashutosh Nandeshwar, 2009, “Tableau Data Visualizaton Cookbook”, PACKT publishing.
5. Hadley Wickham , 2009, ggplot2: Elegant Graphics for Data Analysis
6. Alexandru C. Telea , 2007. “Data Visualization principles and practice” Second Edition, CRC Publications

WEB LINKS:

1. <https://www.tableau.com/>
2. <https://www.tutorialspoint.com/tableau/index.htm>
3. <https://www.coursera.org/specializations/data-visualization>
4. <https://towardsdatascience.com/tableau-visualizations>

SEMESTER-III
ORGANIZATIONAL BEHAVIOUR
(THEORY)

3H-2C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives:

- 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 understand 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.
- To realize the importance of groups and teamwork and managing of conflict between the members of the organization

Course outcomes (cos):

Learners should be able to

COs	Course Outcomes	Blooms Level
CO1	Analyse organizational behavior issues in the context of the organizational behavior theories and concepts.	Analyze
CO2	Assess the behavior of the individuals and groups in organization and manage the stress	Create
CO3	Manage team, power, politics and conflict arising between the members.	Understand
CO4	Explain how organizational change and culture affect the working relationship within organizations.	Create
CO5	Understand and exhibit the communication skills to convey the thoughts and ideas of case analysis to the individuals and group.	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				S				L		M		
CO2				M						S		
CO3	M							M	L			M
CO4	M	L										S
CO5	S	M										

S-Strong; M-Medium; L-Low

UNIT-I Organization Behavior Introduction**8 HOURS**

Organization Behavior: Meaning and definition - Fundamental concepts of OB - Contributing disciplines to the OB field – OB Model - Significance of OB in the organization success - Challenges and Opportunities for OB.

UNIT-II Behavior and Personality**7 HOURS**

Attitudes – Sources - Types - Functions of Attitudes. Values – Importance - Types of Values. 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 - 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**7 HOURS**

Organizational culture- Characteristics of Culture- Types of Culture – Creating and Maintaining an Organizational Culture. Organizational change – Meaning - Forces for Change - Factors in Organizational Change - Resistance to change- Overcoming resistance to change.

SUGGESTED BOOKS

1. Fred Luthans. (2017). *Organizational Behavior: An Evidence - Based Approach*, 12th edition, McGraw Hill Education, New Delhi.
2. Steven Mcshane and Mary Ann VonGlinow (2017), *Organizational Behavior*, 6th edition, McGrawHill Education, New Delhi
3. Robbins, S. P., and Judge, T.A. (2016). *Organizational Behaviour*. (16th edition). New Delhi: PrenticeHall of India.
4. Laurie J. Mullins (2016), *Management and Organisational behaviour*, 10th edition, Pearson Education, New Delhi

5. Robbins, S. P., and Judge, T.A. (2016). *Essentials of Organizational Behavior*. 13th edition, Pearson Education.

WEB LINKS:

1. <https://nptel.ac.in/courses/110/105/110105033/>

SEMESTER-III
MATERIALS CHARACTERIZATION
(THEORY)

3H-2C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To Study materials is always important, for any application, including fabrication of satellites.
 - To introduce various methods available for characterizing the materials. The characterization of materials specifically addresses that portfolio with which researchers and educators must have working familiarity.
 - To provide an introduction to materials characterization and its importance
 - To discuss different types of characterization techniques and their uses.
 - To introduce the students to the principles of optical and electron microscopy, X-ray diffraction and various spectroscopic techniques
- Introduction:

Course Outcomes (COs)

After completing the course, the students will / can able to

COs	Course Outcomes	Blooms Level
CO1	Handle with X-ray, thermal, microscopic, and electrical methods of characterization.	Analyze
CO2	Understand and describe the fundamental principles behind the methods of characterization which are included in the curriculum	Create
CO3	Analyze, interpret and present observations from the different methods.	Understand
CO4	Evaluate the uncertainty of observations and results from the different methods.	Create
CO5	Understand the history of materials science with basic understanding of metals, binary alloys, magnetic materials, dielectric materials and polymers	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M			M	S							
CO2				S	L				L	M	S	
CO3	M	M			M							
CO4	M										L	
CO5	S	M	M	S	M		L		S			

S-Strong; M-Medium; L-Low

UNIT-I

8 HOURS

X-ray techniques for materials characterization X-ray diffraction: Principle, measuring system and applications for characterization of powdered materials. X-ray diffraction profile and analysis: FWHM and line broadening, Crystallite size effect and Scherrer formula, Effect of strain (tensile vs compressive, uniform vs. non-uniform) Introduction to Extended X-ray absorption fine structure (EXAFS), Surface extended X-ray absorption (SEXAFS).

UNIT-II

7 HOURS

Microscopic techniques Principles, instrumentations and applications of Optical microscope, Scanning Electron Microscope (SEM), Transmission Electron Microscope (TEM) for characterization of different samples. Energy dispersive X-ray microanalysis (EDS) - Basic aspects of atomic force microscopy (AFM).

UNIT-III

7 HOURS

Spectroscopic methods Principle, instrumentation and applications of UV-Visible Diffuse Reflectance (UV-Vis DRS) spectroscopy, Ft-Ir, Raman and Fluorescence spectroscopy. Hand of experience on operation of UV-Vis-DRS, FT-IR, Raman and data analysis.

UNIT-IV

7 HOURS

Thermoanalytical Methods Principle, instrumentation and applications of Thermogravimetric Analysis (TGA), Differential Temperature Analysis (DTA) and Differential Scanning Calorimetry (DSC). Factors affecting the TGA/DTA/DSC results and their interpretations. Hand on on experience of operation of TG/DSC and data analysis.

UNIT-V**7 HOURS**

Electroanalytical Techniques Voltammetric principles, hydrodynamic voltammetry, stripping voltammetry, cyclic voltammetry, criteria of reversibility of electrochemical reactions, quasi-reversible and irreversible processes, qualitative and quantitative analysis current-potential relation applicable for Linear Sweep Voltammetry (LSV) and Cyclic Voltammetry (CV), interpretation of cyclic voltammograms and parameters obtainable from voltammograms. Hand on experience on operation of CV and data analysis.

SUGGESTED BOOKS

1. Theory and Applications of UV Spectroscopy, H.H.Jaffe and M.Orchin, IBH-Oxford.
2. Inorganic spectroscopic methods, A.K. Brisdon, Oxford Chem. Primers, 1997, New York.
3. Applied Electron Spectroscopy for Chemical Analysis Ed. H. Windawi and F.L.Ho, Wiley Inter science.
4. Introduction to Spectroscopy, Pavia, Brooks/Cole Cenage, 4th edition, 2009, Belmont.
5. Introduction to Photoelectron Spectroscopy, P.K.Ghosh, John Wiley.
6. Fundamental of Molecular Spectroscopy, C. N. Banwell and E. McCash, Tata McGraw Hill, 4th edition, 1994, New Delhi.

SEMESTER-III
NUMERICAL METHODS AND PROGRAMMING
(THEORY)

3H-2C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- Computational physics may be broadly defined as 'the science of using computers to assist in the solution of physical problems, and to further physics research.
- To equip the students of M.Sc. Physics with knowledge of programming in C, roots of equation, interpolation, curve fitting, numerical differentiation, numerical integration, solution of ordinary differential equations
- To introduce students to computational methods for simulating physical systems and solving problems arising in physics and astronomy, as well as in other related fields
- Computers now play a role in almost every branch of physics like large scale quantum mechanical calculations in nuclear, atomic, molecular and condensed matter physics, large scale calculations in such fields as hydrodynamics, astrophysics, plasma physics, meteorology and geophysics etc.
- The huge increase in the power of computers in recent years has made an impact on the role of computational physics.

Course Outcomes (COS)

After completing the course the students will/able to

COs	Course Outcomes	Blooms Level
CO1	Programme numerical methods and their implementation like applying to problem in physics, including modeling of classical physics to quantum system as well as data analysis (Linear and non linear).	Understand
CO2	Analysis techniques for propagating error, representing data graphically. Create, solve and interpret basic mathematical tool.	Analyze
CO3	Program independently computers using leading-edge tools	Understand
CO4	Formulate and computationally solve a selection of problems in physics	Create
CO5	Use the tools, methodologies, language and conventions of physics to test and Communicate ideas and explanations.	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			L				L					
CO2				S	L				L		S	
CO3	M											
CO4	M			M	S						L	
CO5	S						L		S			

S-Strong; M-Medium; L-Low

UNIT- I

8 HOURS

Errors, different type of errors. Representation of numbers in computer, computer arithmetic, zero in floating point number.

UNIT- II

7 HOURS

Operators –finite differences, average, differential, etc., their inter-relations. Difference of polynomials. Difference equation. Interpolation. Lagrange's methods, error terms. Uniqueness of interpolating polynomial.

UNIT- III

7 HOURS

Newton's fundamental interpolation. Forward, backward and central difference interpolations. Interpolation by iteration. Spline interpolation, comparison with Newton's interpolation. Hermite's interpolation. Bivariate interpolation, Lagrange and Newton's methods. Inverse interpolation.

UNIT- IV

7 HOURS

Approximation of function. Least square method. Use of orthogonal polynomials. Approximation by Chebyshev polynomials, Max-min principle. Economization of power series.

UNIT- V

7 HOURS

Python Programming –Loops- Conditional statements- Functions- Object-oriented programming- Array computing- 2 and 3d visualizations

SUGGESTED BOOKS

1. E. Balagurusamy, "Numerical Methods", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1999
2. W.H. Press, B.P. Flannery et al., "Numerical Recipes: Art of Scientific Computing", 3rd Edition, Cambridge Press, 2007.
3. J. M. Mathews and K. Fink, "Numerical Methods using MATLAB ", 4rd Edition, Prentice Hall Publication, 2004
4. Dr. B.S. Grewal, "Numerical Methods in Engineering and Science ", Khanna Publication.

5. Robert J schilling, Sandra I harries , " Applied Numerical Methods for Engineers using MATLAB and C.", Thomson Brooks/cole.
6. Richard L. Burden, J. Douglas Faires, "Numerical Analysis", Thomson / Brooks/cole
7. John. H. Mathews, Kurtis Fink , "Numerical Methods Using MATLAB" ,Prentice Hall publication
8. JAAN KIUSALAAS , "Numerical Methods in Engineering with MATLAB", Cambridge Publication

WEB LINKS:

1. <https://archive.nptel.ac.in/content/>

SEMESTER-III
ROBOTICS PROCESS AUTOMATION
(THEORY)

3H-2C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- Understand the RPA and the ability to differentiate it from other types of automation.
- Model the sequences and the nesting of activities
- Model the workflow of different scrapping methodologies
- Understand to handle the exceptions and will troubleshoot towards the solution
- Experiment with workflow in a manner to get the optimized output from a Bot.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Describe RPA, where it can be applied and how it's implemented.	Analyze
CO2	Describe the different types of variables, Control Flow and data manipulation techniques.	Analyze
CO3	Identify and understand Image, Text and Data Tables Automation.	Apply
CO4	Describe how to handle the User Events and various types of Exceptions and strategies.	Apply
CO5	Understand the Deployment of the Robot and to maintain the connection	Create

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S					M			M			
CO2						S			S			
CO3				S			M		S			
CO4	M	M					M	L	M			
CO5		M	L	M								

S-Strong; M-Medium; L-Low

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 to RPA Tool - 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 Handling

7 HOURS

What are assistant bots? - Monitoring system event triggers - Hotkey trigger - Mouse trigger - System trigger - Monitoring image and element triggers - An example of monitoring email - Example of monitoring a copying event and blocking it - Launching an assistant bot on a keyboard event.

Exception Handling

Debugging and Exception Handling - Debugging Tools - Strategies for solving issues - Catching errors.

UNIT-V DEPLOYING AND MAINTAINING THE BOT:**7 HOURS**

Publishing using publish utility - Creation of Server - Using Server to control the bots
- Creating a provision Robot from the Server - Connecting a Robot to Server - Deploy
the Robot to Server - Publishing and managing updates - Managing packages -
Uploading packages - Deleting packages

SUGGESTED BOOKS

1. Alok Mani Tripathi, "Learning Robotic Process Automation", Packt Publishing, 2018.
2. Frank Casale , Rebecca Dilla, Heidi Jaynes , Lauren Livingston, "Introduction to Robotic Process Automation: a Primer", Institute of Robotic Process Automation, 1st Edition 2015.
3. Richard Murdoch, Robotic Process Automation: Guide to Building Software Robots, Automate Repetitive Tasks & Become an RPA Consultant", Independently Published, 1st Edition 2018.
4. Srikanth Merinda," Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation", Consulting Opportunity Holdings LLC, 1st Edition 2018.
5. Lim Mei Ying, "Robotic Process Automation with Blue Prism Quick Start Guide: Create software robots and automate business processes", Packt Publishing, 1st Edition 2018.

WEB LINKS:

1. <https://www.uipath.com/rpa/robotic-process-automation>
2. <https://www.academy.uipath.com>

SEMESTER-III
NUTRITION AND DIETETICS
(THEORY)

3H-2C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- Fundamentals of food, nutrients and their relationship to health
- Respect to deriving maximum benefit from available food resources
- Understanding of the consequences of vitamin and mineral deficiency/excess of vitamin
- Respect to the nutrition in adult age
- Nutrition deficiency diseases and their consequences
- Food adulteration and prevention of food adulteration

Course Outcomes (COs)

After successful completion, the students will understand:

COs	Course Outcomes	Blooms Level
CO1	The fundamentals of nutrition and their relationship to health	Understand
CO2	To derive maximum benefits from available food resources	Understand
CO3	The consequences of vitamin and mineral deficiency/excess of vitamin	Understand
CO4	The nutrition in adult age	Remember
CO5	Nutrition deficiency diseases and their consequences	Remember
CO6	The sources of food adulteration and measures to prevent it	Create

Mapping With Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	L	L	L	L	L	L	L
CO2	L	L	L	L	L	L	L
CO3	L	L	L	L	L	L	L
CO4	L	L	L	L	L	L	L
CO5	L	L	L	L	L	L	L
CO6	L	L	L	L	L	L	L

UNIT-I

8 HOURS

Basic concepts in food and nutrition- Understanding relationship between food, nutrition and health, Functions of food- Physiological, psychological and social. Dietary guidelines for Indians food pyramid. Junk foods and its causes.

UNIT- II**7 HOURS**

Nutrients - 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**7 HOURS**

Adult nutrition 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, Breastfeeding biology, Breastfeeding support and Counselling, Infant and young child feeding and care - Current feeding practices and nutritional concerns, guidelines for infant and young child feeding, Breast feeding, weaning and complementary feeding. Assessment and management of moderate and severe malnutrition among children, Micronutrient malnutrition among preschool children. Child health and morbidity, neonatal, infant and child mortality.

UNIT- IV**7 HOURS**

Introduction to Nutritional deficiency diseases -Causes, symptoms, treatment, prevention of the following: Protein Energy Malnutrition (PEM), Vitamin A Deficiency (VAD), Iron Deficiency Anaemia (IDA), Iodine Deficiency Disorders (IDD), Zinc Deficiency, Fluorosis. Nutritional needs during pregnancy, common disorders of pregnancy (Anaemia, 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**7 HOURS**

Dietetics : Diet for diabetes mellitus-Nutrition recommendations for patient with diabetes, Meal planning, Exchange list of different food groups, Glycemic index based formulation of diet for diabetic individual, Diabetic diets menu wise. Diet for Cardiovascular Diseases -Dietary management and general guidelines for coronary heart disease, Dietary recommendations of WHO. Diet for Acute cardiac diseases. Influence of diet on carcinogenesis, Dietary risk factors and cancers at various sites in the human body, diet

therapy, diet for cancer patients, managing eating problems during treatment. Hormonal imbalance-Poly cystic ovarian syndrome, hypogonadism, cushing syndrome. Causes of hormonal imbalance. Treatment- Dietary and stress management protocols to be followed.

SUGGESTED BOOKS

1. Gordon M, Wardlaw and Paul M. (2012). Perspectives in Nutrition: U.S.A. McGraw Hill Publishers. 9rd Edition. New Delhi
2. Srilakshmi.B. (2014) Nutrition Science: New Age International(P) Ltd. Publishers 4th Edition. New Delhi.
3. Srilakshmi.B. (2015) Food Science. New Age International (P) Ltd. Publishers. 6nd Edition., New Delhi
4. Darshan Sohi (2012). A Comprehensive Textbook of Nutrition & Therapeutic Diets. Jaypee Brothers Medical Publishers Pvt. Ltd.

SEMESTER-III
CYBER FORENSICS
(THEORY)

3H-2C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To understand about computer forensics and investigations.
- To know about digital evidence and crime.
- To analyse and validate forensics data.
- To know about e-mail investigation.
- To understand about Mobile device forensics.

Course Outcomes (COs)

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

COs	Course Outcomes	Blooms Level
CO1	Define, understand and explain various investigation procedures and summarize duplication of digital evidence.	Remember
CO2	Apply the knowledge of digital evidences.	Understand
CO3	Design and develop various forensics tools and analyse the network forensics.	Create
CO4	Demonstrate the systematic study of high-tech forensics	Understand
CO5	Understand the importance of reports.	Evaluate

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L	L	M	L	M	M	M	M	L	L	M	M
CO2	S	M	M	M	L	L	M	M	S	S	L	M
CO3	S	M	L	L	S	S	L	M	S	S	S	L
CO4	L	S	S	S	M	M	S	L	L	L	M	S
CO5	L	M	S	M	L	L	S	S	L	L	L	S

S-Strong; M-Medium; L-Low

Unit-I Computer forensics and investigations**8 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**7 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.

SUGGESTED 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”, Academic Press, 1st Edition,
3. John R Vacca,.(2016).“Computer Forensics”, Cengage Learning, 2nd Edition.

WEB LINKS:

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

SEMESTER-III
PERSONAL FINANCE AND PLANNING
(THEORY)

3H-2C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To familiarize with regard to the concept of Investment Planning and its methods
- To examine the scope and ways of Personal Tax Planning;
- To analyze Insurance Planning and its relevance
- To develop an insight in to retirement planning and its relevance.
- To construct an optimal portfolio in real life situations

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

8 HOURS

Introduction to Financial Planning - 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

7 HOURS

Investment Planning - 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

7 HOURS

Personal Tax Planning - 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**7 HOURS**

Insurance Planning - 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**7 HOURS**

Retirement Benefits Planning - Retirement Planning Goals, Process of retirement planning, Pension plans available in India, Reverse mortgage, New Pension Scheme. Exemption available under the Income-tax Act, 1961 for retirement benefits.

SUGGESTED BOOKS

1. Indian Institute of Banking & Finance. (2017). Introduction to Financial Planning. New Delhi: Taxmann Publication.
2. Pandit, A. (2014). The Only Financial Planning Book that You Will Ever Need. Mumbai: Network Publications Ltd.
3. Sinha, M. (2008). Financial Planning: A Ready Reckoner. New York: McGraw Hill Education.
4. Halan, M. (2018). Let's Talk Money: You've Worked Hard for It, Now Make It Work for You. New York: HarperCollins Publishers.
5. Tripathi, V. (2017). Fundamentals of Investment. New Delhi: Taxmann Publication.

SEMESTER-III
CHEMISTRY IN EVERYDAY LIFE
(THEORY)

3H-2C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To gain knowledge in the importance of chemistry in food industry.
- To understand the chemistry of medicines and cosmetics.
- To study about chemistry in energy utilization and storage process.
- To know about the chemistry of soaps, detergents and textiles.
- To learn about the chemistry behind the polymers, fuel and agriculture.

Course Outcomes (CO's)

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

COs	Course Outcomes	Blooms Level
CO1	Illustrate the importance of chemistry in food industry.	Apply
CO2	Explain the chemistry of medicines and cosmetics.	Understand
CO3	Utilization of chemistry concepts in energy storage devices	Apply
CO4	Discuss about the chemistry of soaps, detergents and textiles.	Understand
CO5	Apply the concept of chemistry in polymers, fuel and agriculture industry.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	L	M	L	S	L	M	M	S
CO2	S	S	L	M	M	S	M	M	L	M
CO3	M	S	S	S	M	S	M	S	M	S
CO4	S	S	M	M	S	S	M	S	M	S
CO5	S	S	S	M	S	S	M	S	M	S

UNIT - I Importance of Chemistry in food**8 HOURS**

Chemicals in food, colouring agents, artificial preservatives, flow stabilizers, binding substance, flavours and sweeteners, antioxidants, minerals, vitamins. Chemistry at the breakfast table, raising agents- gluten, the taste maker- glutamic acid, stimulants- Caffeine, chemistry of onion, garlic and curcumin.

UNIT - II Chemistry in medicines and cosmetics**8 HOURS**

Elements in the human body, drugs and their classification, drug-target interaction, action of different classes of drugs, antiseptics and disinfectants.
Cosmetics: Chemistry behind the lotions, fragrances, talcum powder, sunblock and sunscreen, toothpaste, lipsticks, nail polishes.

UNIT - III Chemistry in energy**8 HOURS**

Solar energy - fuel from sun light - splitting of water - hydrogen from sunlight - hydrogen economy - fuel cells - batteries - photovoltaics - stealing the sun - nuclear energy - nuclear fission and fusion - production of electricity by a nuclear reactor - radioactivity and the hazards of radioactivity - living with nuclear power.

UNIT - IV Importance of chemistry in soaps, detergents and textiles 6 HOURS

Detergents and soaps, types of soaps and detergents, saponification, cleansing action of soaps and detergents, perfumes used in soaps.

Textiles: Chemistry behind wool, silk, jute, cotton, glass fibre, polyester, acrylic, nylon, and other raw materials.

UNIT - V Chemistry of polymers, fuel and agriculture**6 HOURS**

Polymers, types, polyethylene, plastics, disposal of plastics, degradation of polymers and plastics using nano materials. Petrochemistry, petrol, diesel, LPG, CNG, kerosene, oils, and other fuels. Agriculture: fertilizers, herbicides, insecticides, and fungicides.

SUGGESTED BOOKS

1. Tripathy, S. N., & Sunakar Panda (2004). *Fundamentals of Environmental Studies* (II Edition). New Delhi: Vrianda Publications Private Ltd.
2. Arvind Kumar (2004). *A Textbook of Environmental Science*. New Delhi: APH Publishing Corporation.
3. Anubha Kaushik, C. P., & Kaushik (2004). *Perspectives in Environmental Studies*. New Delhi: New Age International Pvt. Ltd. Publications.
4. Seymour R. B., & Charles, E. (2003). *Seymour's Polymer Chemistry: An Introduction*. Marcel Dekker, Inc.
5. Stocchi, E. (1990). *Industrial Chemistry* (Vol-I). UK: Ellis Horwood Ltd.
6. Jain, P. C., & Jain, M. (2004). *Engineering Chemistry*. Delhi: Dhanpat Rai & Sons.
7. Sharma, B. K., & Gaur, H. (1996). *Industrial Chemistry*. Meerut: Goel Publishing House.

SEMESTER-III
FERMENTATION TECHNOLOGY
(THEORY)

3H-2C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objective

- To encompass the use of microorganisms in the manufacture of food or industrial products on the basis of employment.
- Get equipped with a theoretical and practical understanding of industrial microbiology
- Appreciate how microbiology is applied in the manufacture of industrial products
- Know how to source microorganisms of industrial importance from the environment
- Know about the design of bioreactors, factors affecting growth and production, heat transfer, oxygen transfer
- Understand the rationale in medium formulation & design for microbial fermentation, and sterilization of medium and air.

Course Outcomes(Cos)

Students will be able to

COs	Course Outcomes	Blooms Level
CO1	Provide knowledge in the large-scale production of industrial product, and teaches the modern employment trends to cater the needs of industry.	Understand
CO2	Differentiate the types of fermentation processes	Apply
CO3	Understand the biochemistry of various fermentations	Understand
CO4	Identify techniques applicable for Improvement of microorganisms based on known biochemical pathways and regulatory mechanisms	Analyze
CO5	Comprehend the techniques and the underlying principles in downstream processing	Apply
CO6	Explore the practical skills in research activities.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	M	M	M	S	L	M	M	M	M	M	M
CO2	M	M	S	S	L	L	M	M	M	M	M
CO3	M	S	M	M	M	M	M	M	M	M	M
CO4	M	S	M	M	M	S	S	M	M	M	M
CO5	L	S	M	M	M	M	M	S	L	S	L
CO6	S	S	S	L	M	M	M	M	L	M	M

S-Strong; M-Medium; L-Low

EXPERIMENTS

1. Provides knowledge in the large-scale production of industrial product, and teaches the modern employment trends to cater the needs of industry.
2. Students will differentiate the types of fermentation processes
3. Understand the biochemistry of various fermentations
4. Identify techniques applicable for Improvement of microorganisms based on known biochemical pathways and regulatory mechanisms
5. Comprehend the techniques and the underlying principles in downstream processing
6. Students can able to explore the practical skills in research activities.

UNIT-I Basics of fermentation processes

8 HOURS

Definition, scope, history, and chronological development of the fermentation industry. Component parts of the fermentation process. y. Component parts of fermentation process. Microbial growth kinetics, batch and continuous, direct, dual or multiple fermentations; scaleup 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, pectinases and lipases) primary screening for producers, large scale production. Immobilization methods.

UNIT-V Alcohols and Beverages**7 HOURS**

Fermentative production of industrial alcohol, production of beverages. Production of organic acids: citric acid, aminoacids: glutamic acid, production of vitamins. fungal enzymes and Single cell protein.

SUGGESTED 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.Freemn 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.
5. Harider, S.I. and Ashok, A. 2009. Biotechnology, A Comprehensive Training Guide for the Biotechnology Industry, CRC Press, New York.
6. Sridhar, S.2010. Industrial Microbiology, Dominant Publishers, New Delhi.
7. Tanuja.S and Purohit, S.S. 2008. Fermentation Technology, Agrobios Publication, Jodhpur, India.

SEMESTER-III
ENGLISH FOR COMPETITIVE EXAMINATION
(THEORY)

3H-2C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To train learners to crack competitive exams
- To know of various tools that is essential for 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.

Course Outcomes(Cos)

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

COs	Course Outcomes	Blooms Level
CO1	The student may settle in life with a government job.	Apply
CO2	The student may develop various skills	Understand
CO3	The successful student may guide other students to success.	Understand
CO4	Analyse logical reasoning questions, error analysis, and correct usage of words.	Analyze
CO5	Develop the knowledge of grammatical system of English language.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	S	M	M	S	L	M	M	L		
CO2	L	M	M	M	M	L	M	S	M	L		
CO3	L	M	L	M	M	L	L	M	M	L		
CO4	M	M	M	S	S	M	M	S	M	L		
CO5	M	S	M	M	M	M	L	M	M	L		

S-Strong; M-Medium; L-Low

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

SUGGESTED BOOKS

1. V. Saraswathi, Maya K. Mudbhatkal (2014). English for Competitive Examinations. Emerald: Chennai.

SEMESTER-III
SERICULTURE
(THEORY)

3H-2C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

The main objectives of the course are

- To apply knowledge and skills of Seri biotechnology for development new mulberry variety and silkworm breeds suitable for varied agro-climatic zones.
- To apply tools and techniques of biostatistics for critical analysis and interpretation of data accrued.
- To use bioinformatics tools and techniques for the analysis and interpretation of bimolecular data for better understating mulberry and silkworm.
- To demonstrate communication skills, scientific writing, data collection and interpretation abilities in all the fields of Seri biotechnology.
- Thorough knowledge and application of good laboratory and good manufacturing practices in sericulture and biotech industries.
- To demonstrate entrepreneurship abilities, innovative thinking, planning, and setting up small-scale enterprises.

Course Outcomes(COs)

On completion of the course, students are able to

COs	Course Outcomes	Blooms Level
CO1	Know the different components and chain link of sericulture industry.	Understand
CO2	Understand concepts of sericulture industry and demonstrate interdisciplinary skills acquired in mulberry plant cultivation and silkworm rearing.	Understand
CO3	Demonstrating the Laboratory and field skills in mulberry cultivation and Silkworm rearing with an emphasis on technological aspects.	Create
CO4	Transfer the knowledge and technical skills to the Seri-farmers.	Understand
CO5	Analyze the environmental issues and apply in management of mulberry garden and silkworm rearing at field.	Analyze
CO6	Demonstrate comprehensive innovations and skills in improvement of mulberry and silkworm varieties for betterment of sericulture industry and human welfare.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	L	S	S
CO2	S	S	S	S	L	S	S
CO3	S	S	S	S	L	S	S
CO4	M	M	M	M	L	M	M
CO5	M	M	M	M	L	M	M
CO6	M	M	M	M	L	M	M

S-Strong; M-Medium; L-Low

UNIT-I

8 HOURS

Introduction to Sericulture - History of Sericulture – Sericulture organization in India, By products of silk industry. Mulberry and Non – mulberry silkworm types–Morphology and Life cycle of Bombyxmori,

UNIT-II

7 HOURS

Mulberry Cultivation: Mulberry Varieties – Methods of Irrigation –Nutrient Management and Weed control. Pruning and Harvesting – Crop improvement – Mechanism in Moriculture – Pest and Disease, deficiencies and symptoms in Mulberry.

UNIT-III

7 HOURS

Rearing of silkworm – Rearing Appliances – rearing operation. Harvesting and marketing of cocoons. Cocoon processing and reeling - Appliances used for reeling. Pre reeling process – Cocoon boiling. Reeling technology – re-reeling technology.

UNIT-IV

7 HOURS

Non – Mulberry Sericulture Scope of Non-mulberry Sericulture - Non-mulberry silk varieties and fauna, tasar, muga, eri – Silk Production and Marketing – Tropical tasar / muga – Morphology, anatomy grainage

UNIT-V

7 HOURS

Diseases of silkworm –Pebrine Protozoan, Flacheriebacterial,Nuclear Polyhedrosisviral and Muscardine fungal diseases. Pests of Silkworm.

SUGGESTED BOOKS

1. Krisnamoorthy S., Improved Method of Rearing Young Age Silk Worms: Reprinted by CSB, Bangalore, 1986.
2. Tanaka Y., Sericology, CSB, Pub., Bangalore, 1964.
3. Ullal S.R., and Narasimhan M.N., Hand Book of Practical Sericulture, CSB, Bangalore, 1987.
4. Hisao Aruga, Principles of sericulture, Oxford and IBH Publishing Company, 1994.
5. Hrcrama Reddy, G. 1998. Silkworm Breeding, Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi.
6. Otsuki et.al. 1987. Silkworm Egg Production (Translated from Japanese Language), Oxford wild IBH Publishing Co. Pvt. Ltd., New Delhi.
7. Yasuji Hamamura, 2001 Silkworm Rearing on Artificial Diet (Translated from Japanese Language), Oxford wild IBH Publishing Co. Pvt. Ltd., New Delhi.
8. Mahadevappa, D. Halliyal, V.G., Sankar, D.G and Bhandiwad, R. 2000. Mulberry Silk Reeling Technology, Oxford wild IBH Publishing Co. Pvt. Ltd., New Delhi.
9. Dandin, S.B et.al. 2003. Advances in Tropical Sericulture, National Academy of Sericulture Sciences India, Central Silk Board, Bangalore, India.
10. Ganga G., Sulochanachetty. J. An Introduction of Sericulture. Oxford, New Delhi – 1977.
11. Johnson M., and Kesary M., Sericulture, CSI Press, Marthandam, 2008.
12. Text Book of Tropical Sericulture, Pub., Japan Overseas Volunteers, 1975

SEMESTER-III
CODING THEORY
(THEORY)

3H-2C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- Elements of coding theory and its applications.
- Understand the concept of bounds in coding theory.
- About the encoding and decoding.
- Analyze the concept of cyclic coding
- Acquiring the knowledge special cyclic codes.

Course Outcomes(Cos)

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

COs	Course Outcomes	Blooms Level
CO1	Recognize the basic concepts of coding theory.	Apply
CO2	Understand the importance of finite fields in the design of codes.	Understand
CO3	Detect and correct the errors occur in communication channels with the help of methods of coding theory.	Apply
CO4	Apply the tools of linear algebra to construct special type of codes.	Apply
CO5	Use algebraic techniques in designing efficient and reliable data transmission methods.	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1							S			
CO2							S			
CO3							S			
CO4							S			
CO5							S			

S-Strong; M-Medium; L-Low

UNIT-I Error Detection, Correction and Decoding**8 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**7 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.

SUGGESTED BOOKS

1. San Ling and Chaoping Xing (2004). Coding Theory: A first course, Cambridge University Press.
2. Lin. S & Costello. D. J. (1983). Jr., 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.
4. Berlekamp E.R. (1968). Algebraic Coding Theory, Mc Graw-Hill.
5. H. Hill (1986). A First Course in Coding Theory, OUP.

WEB LINKS:

1. <https://www.youtube.com/watch?v=XepXtl9YKwc>
2. <https://www.youtube.com/watch?v=oeQWxhlnCHM>
3. <https://www.youtube.com/watch?v=Z-QGtxlQWak>

**Master of Computer Applications
23CAP391**

2023-2024

**SEMESTER-III
INTERNSHIP**

0H –2C

**Instruction Hours / week: L: 0 T: 0 P: 0 Marks: Internal: 100 External: 0 Total: 100
End Semester Exam: 3 Hours**

SEMESTER IV
PROJECT AND VIVA VOCE **14C**

Instruction Hours / week: L:0 T:0 P:0 Marks: Internal: 80 External: 120 Total: 200
End Semester Exam: 3 Hours