



KARPAGAM ACADEMY OF HIGHER EDUCATION

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

FACULTY OF ARTS, SCIENCE, COMMERCE AND MANAGEMENT UNDER– GRADUATE PROGRAMMES (REGULAR PROGRAMME)

REGULATIONS (2024)

CHOICE BASED CREDIT SYSTEM (CBCS)

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

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FACULTY OF ARTS, SCIENCE, COMMERCE AND MANAGEMENT UNDERGRADUATE PROGRAMMES REGULAR MODE CHOICE BASED CREDIT SYSTEM (CBCS)

REGULATIONS – 2024

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

1 PROGRAMMES OFFERED, MODE OF STUDY AND ADMISSION REQUIREMENTS

1.1 UG Programmes Offered

A candidate may undergo a programme in any one of the undergraduate programmes approved by the KAHE as given below.

S. No.	PROGRAMME	DISCIPLINE
1.	B.Com.	Commerce
2.	B.Com.	Computer Applications
3.	B.Com.	Professional Accounting
4.	B.Com.	Business Process Services
5.	B.Com.	Financial Analytics
6.	B.Com.	International Accounting and Finance
7.	B.Com.	Information Technology
8.	B.Com.	FinTech
9.	BBA	Business Administration
10.	B.Sc.	Biotechnology
11.	B.Sc.	Microbiology
12.	B.Sc.	Computer Science
13.	B.Sc.	Information Technology
14.	B.Sc.	Computer Technology

15.	B.Sc.	Computer Science (Cognitive Systems)
16.	B.Sc.	Computer Science (Artificial Intelligence and Data Science)
17.	B.Sc.	Computer Science (Cyber Security)
18.	BCA	Computer Applications

1.2 Admission Requirements (Eligibility)

A candidate for admission to the first year of the UG degree programme shall be required to have passed the Higher Secondary Examination (10 + 2) [Academic or Vocational] prescribed by the Government of Tamil Nadu Board or any similar examination of any other Board accepted by the KAHE as equivalent thereto. (Annexure I)

1.3 Mode of Study

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

2. DURATION OF THE PROGRAMMES

2.1 The minimum and maximum period for the completion of the UG Programmes are given below:

Programme(s)	Min. No. of Semesters	Max. No. of Semesters
B.Sc., B.Com., BCA and BBA	8	14

2.2 Each semester normally consists of 90 working days or 450 Instructional hours of study. Examination shall be conducted at the end of every semester for the respective courses.

2.3 Multiple Entry and Exit

The students are allowed to exit the programme after 2 or 4 or 6 or 8 semesters with Undergraduate Certificate, Undergraduate Diploma, Undergraduate Degree and Undergraduate Degree with Honors/Honors (Research) respectively as per the regulations of NEP 2020. Similarly, the students from other institutions can join our university in the 3rd or 5th or 7th semester with an appropriate Undergraduate Certificate or Undergraduate Diploma or Undergraduate Degree certificates respectively.

3. CHOICE BASED CREDIT SYSTEM

Credit means the weightage given to each course by the experts of the Board of Studies concerned. All programmes are offered under Choice Based Credit System with a total number of 132 credits for three years. Additional credits of 40 can also be earned on successful completion of fourth year. A total of 172 credits are offered as per the UGC Guidelines for the four year UG Programme.

4. STRUCTURE OF THE PROGRAMME

4.1 Tamil or any one of the Indian / Foreign Languages *viz*, Hindi, Malayalam Sanskrit, French is offered as an Ability Enhancement Course (AEC) for Arts, Science, Commerce and Management Programmes. Twelve credits are awarded for each course and the examinations will be conducted at the end of each semester.

4.2. Major Courses, Minor Courses, Multidisciplinary Courses (MDC), Skill Enhancement Courses (SEC), Project Work, Ability Enhancement Courses, Value Added Courses (VAC) (Common to all UG Programmes), Summer Internship, Minor Project (for 3 Year programme), Research Project/Dissertation (for 4 Year programme) are part of curricular structure.

4.2.1. Major Courses

Major Courses consist of theory and practical of department domains for which examinations shall be conducted at the end of each semester. The students have to earn 82 to 86 Credits in Major Courses (Four years).

4.2.2. Minor Courses

Students have courses from disciplinary/interdisciplinary minors and skill-based courses. Students have to earn a minimum of 32 Credits in Minor Courses (Four years).

4.2.3. Multidisciplinary Courses (MDC)

All UG students are required to undergo 3 introductory-level courses relating to any of the broad disciplines. These courses are intended to broaden the intellectual experience and form part of liberal arts and science education. The students have to study three Multidisciplinary Courses and they have to earn a minimum of 09 Credits.

4.2.4. Skill Enhancement Courses (SEC)

These courses are aimed at imparting practical skills, hands-on training, soft skills, etc., to enhance the employability of students. Three Skill Enhancement Courses are offered within the first four semesters. The examination shall be

conducted at the end of respective semester. Students have to earn a minimum of 09 Credits in Skill Enhancement Courses.

4.2.5 Minor Project Work

The project work shall start at the beginning of sixth semester in the Department/Industry/Research Institute (National/International) and the project report has to be submitted at the end of the sixth semester. The project may be an individual or group task. The Head of Department concerned shall assign a project supervisor who in turn shall monitor the project work of the student(s). A project / dissertation work shall be carried out by the students and they have to earn 04 to 06 credits.

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

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

4.2.6. Ability Enhancement Course (AEC)

There are four Ability Enhancement Courses offered during the first four semesters. Three credits are awarded for each course and the examinations shall be conducted at the end of each semester. Students have to earn a minimum of 12 Credits in Ability Enhancement Courses.

4.2.7. Internship

The students exiting the programme after first year or second year must have completed 04 credits internship/apprenticeship during first year and second year summer term.

4.2.8. Value Added Courses (VAC)

The students will study Value Added Courses in the first four semesters of their programme. 6 to 8 credits need to be earned under VAC. The examinations will be conducted at the end of each semester for VAC courses.

The assessment of the VAC is based on Internal Evaluation. The components of evaluation and distribution of marks is as follows:

S. No.	Category	Maximum Marks
1.	Assignment	5
2.	Attendance	5
3.	Seminar	5
4.	Test – I (2 ½ Units)	12.5
5.	Test – II (2 ½ Units)	12.5
6.	Final Assessment (5 Units)	60
Total		100

4.2.9. Research Project /Dissertation

The candidates shall undertake the Research Project work in the eighth Semester in the Department/Industry/Research Institute (National / International). The report shall be submitted at the end of the eighth semester. Students have to earn a minimum of 12 Credits in Research Project/Dissertation Work.

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

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

Approval of the project

The candidate has to submit, in consultation with his/her supervisor, the title, objective and the action plan of his/her project to the PAC on the first review. Only after obtaining the approval of PAC, the student can initiate the project work.

5. ADVANCED LEARNERS AND ON-DEMAND EXAMINATION

Students

1. Who secure 7.5 CGPA and maintain an attendance of 75% in every semester.
2. Who clear all the courses in their first appearance itself.

are referred to as advanced learners. When a student fails to maintain any of the above conditions at any given time, he cannot be an advanced learner further.

These students can request for an on-demand examination for the courses in their forthcoming semester(s). These students on prior registration can appear for such examinations well in advance and complete the entire courses well before the prescribed period of study and can progress for a full time Research Project/Internship/Minor Project during the remaining prescribed period of study. The Internal and External examinations will be conducted for these courses as like the other courses. One or more faculty mentors will be allocated based on the number of students/courses enrolled for the on-demand examination.

Also, these advanced learners can register for online courses from NPTEL/SWAYAM/SWAYAM Plus portals on prior and proper registration from the department. The credits earned from those courses will be transferred to the mark statement of the students.

6. CREDIT TRANSFER THROUGH ONLINE PLATFORM / INTERNATIONAL STUDIES

Students are encouraged to enroll in courses offered by MOOC platforms and international institutions of higher learning, either virtually or in person. The equivalent credits for these courses will be determined by a committee named Subject Equivalency Committee comprising the Dean, Head of Department (HoD), and one faculty member nominated by the Vice Chancellor. The committee's decision will be submitted for ratification/approval by the Board of Studies (BoS) and the Academic Council. Additionally, the equivalent grade points for marks/grades/grade points awarded by various MOOC platforms and international institutions of higher learning will be determined by a committee named Grade Equivalency Committee duly constituted by the Vice-Chancellor. The decisions of this committee will be submitted for ratification/approval by the Academic Council. This has been approved to be implemented from the even semester of the academic year 2024-25.

7. EXTRA CURRICULAR ACTIVITIES

Every student is encouraged to participate in at least any one of the following activities:

- National Service Scheme (NSS)
- National Cadet Corps (NCC)
- Sports / Mass drill

- Youth Red Cross (YRC)
- Club activities
- Other Extra-curricular activities

The student's performance shall be examined by the staff in-charge of activities along with the faculty mentor and the Head of the respective department. Marks for Extra-curricular shall be sent to the Controller of Examination (CoE) before the commencement of the Sixth End Semester Examinations. The above activities shall be conducted outside the regular working hours of the KAHE.

8. MEDIUM OF INSTRUCTION

The medium of instruction and examinations for the courses under Language I – Tamil / Hindi / Malayalam / French / Sanskrit shall be in the language concerned. For all other courses, the medium of instruction and examination should be in English.

9. MAXIMUM MARKS

Evaluation: Evaluation of the course comprise of two parts such as the Continuous Internal Assessment (CIA) and the End Semester Examination (ESE).

All the theory and practical courses shall carry a maximum of 100 marks, out of which 40 marks is awarded for Continuous Internal Assessment (CIA) and 60 marks for End Semester Examinations (ESE).

10. FACULTY MENTOR

To help students in planning their courses of study and for general advice on the academic programme, the HoD shall allot twenty students to a faculty who will function as a faculty mentor throughout their period of study. A Faculty mentor shall advise the students and monitor their behavior and academic performance. Problems if any shall be counseled by them periodically. The faculty mentor is also responsible to inform the parents of their mentee's progress. The Faculty mentor shall display the cumulative attendance particulars of his / her mentees periodically (once in 2 weeks) on the Notice Board to know their attendance status and satisfy the clause 14 of this regulation.

11. ONLINE COURSE COORDINATOR

To help students for planning their online courses and for general orientation on online courses, the HoD shall nominate a coordinator for the online courses. The Online course coordinator shall identify the courses which students can select for their programme from the available online courses offered by different agencies periodically and inform the same to the students. Further, the coordinators shall orient the students regarding the online courses and monitor their participation.

12. CLASS COMMITTEE

Every class shall have a Class Committee consisting of the faculty members of various courses of the class concerned, student representatives (Minimum 2 boys and 2 girls of various capabilities and Maximum of 6 members) and the concerned HoD / senior faculty as 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 constitution and functions of the Class Committee shall include

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

13. COURSE COMMITTEE FOR COMMON COURSES

Each common theory course offered to more than one discipline or department 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 respective 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). Course Committee Meeting is conducted once in a semester.

14. REQUIREMENTS TO APPEAR FOR THE END SEMESTER EXAMINATION

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

b. A candidate who has secured attendance between 65% and 74% (both included), due to medical reasons (Hospitalization / Accident / Specific Illness) 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 the Dean. 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 execute an undertaking from the parent and the student should assure that, this situation does not arise in the future.

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

15. PROCEDURE FOR AWARDING MARKS FOR INTERNAL ASSESSMENT

15.1 Attendance and Assessment: Every Faculty is required to maintain an **Attendance and Assessment Record (Log book)** which consists of attendance of students marked for each lecture/practical/ project work, the CIA, Assignment and Seminar marks and the record of class work completed (topic covered), separately for each course. This should be submitted to the HoD once in a week for checking the syllabus coverage, records of test marks and attendance. The HoD shall sign with date after due verification. The same shall be submitted 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.

15.2 Continuous Internal Assessment (CIA): The performance of students in each course will be continuously assessed. Retest will be conducted and considered based on the requirements and recommendations by the Head of the Department on valid reasons. The distribution of marks for the Continuous Internal Assessment (CIA) are given below:

Theory Courses

S. No.	Category	Maximum Marks
1.	Assignment	5
2.	Attendance	5
3.	Seminar	5
4.	Test – I (2 ½ Units)	12.5
5	Test – II (2 ½ Units)	12.5
Total		40

Practical Courses

S.No.	Category	Maximum Marks
1.	Attendance	5
2.	Observation work	5
3.	Record work	5
4.	Internal Practical Assessment	20
5.	<i>Viva – voce</i> [Comprehensive]*	5
Total		40

*

Includes *Viva- voce* conducted during the model Exam practical.

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

15.3 Portions for Test Question Paper

Portions for Internal Test – I : 2 ½ Units

Portions for Internal Test – II : 2 ½ Units

15.4 Pattern of Test Question Paper

Theory Courses:

Maximum Marks : 100

Duration: 3 Hours

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

15.5 Attendance

Distribution of Marks for Attendance

S. No.	Attendance (%)	Maximum Marks
1	91 and above	5
2	81 - 90	4
3	76 - 80	3
4	Less than or equal to 75	0

16. ESE EXAMINATIONS

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

16.2 Pattern of ESE Question Paper:

Theory Courses:

Maximum Marks: 100

Duration: 3 Hours

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

The 100 Marks will be converted to 60 Marks.

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

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

Record Notebooks for Practical Examination

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

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

16.3. Evaluation of Project Work

16.3.1 The project work shall carry a maximum of 100 marks.

(CIA - 40 and ESE – 60*)

*Combined valuation of Internal and External Examiners.

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

16.3.3 The evaluation of the project will be based on the project report submitted and a *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 Controller of Examination. In case the supervisor is not available, the HoD shall act as an Internal Examiner for the same.

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

If a candidate fails in the respective *viva-voce* examinations he/she has to resubmit the Project Report within 30 days from the date of declaration of the results. The same Internal and External examiner shall evaluate the resubmitted report in the subsequent semester.

16.3.5 A Copy of the approved project report after the successful completion of *viva-voce* examination shall be kept in the KAHE library.

17. PASSING REQUIREMENTS

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

17.2 If a candidate fails to secure a pass in a particular course (either CIA or ESE or Both) as per clause 15.1, it is mandatory that the candidate has to register and reappear for the examination in that course during the subsequent semester when examination is conducted for the same till, he / she receives pass both in CIA and ESE (vide Clause 2.1).

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

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

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

18. IMPROVEMENT OF MARKS IN THE COURSES ALREADY PASSED

The Candidates desirous to improve the marks secured in a course which they passed 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.

19. AWARD OF LETTER GRADES

All the 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

20. GRADE SHEET

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

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

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

iv. Remark on Extension Activities (only in the 6th Semester Grade Sheet) GPA of a Semester and CGPA of a programme will be calculated as follows.

$$\text{GPA of a Semester} = \frac{\sum_i C_i G_{P_i}}{\sum_i C_i}$$

Sum of the product of the GP by the corresponding credits of the courses offered in that Semester

Sum of the credits of the courses of that Semester

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

Sum of the credits of the courses

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

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**.

21. REVALUATION

A candidate can apply for revaluation or re-totalling 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. 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

reevaluation and the results will be intimated to the candidate through the HoD concerned. Reevaluation is not permitted for Supplementary Examinations.

22. TRANSPARENCY AND GRIEVANCE COMMITTEE

Reevaluation and Retotaling are allowed on representation (clause 21). 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 and the marks awarded by the External examiner will be final. The student has to pay the prescribed fee for the same.

23. ELIGIBILITY FOR THE AWARD OF THE DEGREE

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

- Successfully completed all the components prescribed under Part I to Part IV in the CBCS pattern to earn the minimum required credits as specified in the curriculum corresponding to his / her programme within the stipulated period (vide clause 2.1).
- No pending disciplinary enquiry/ action against him/her.
- The award of the degree must be approved by the Board of Management.

24. CLASSIFICATION OF THE DEGREE AWARDED

24.1 Candidates who qualify for the award of the Degree (vide clause 23) having passed the examination in all the courses in their first appearance, within the specified minimum number of semesters and securing a **CGPA not less than 8** shall be declared to have passed the examination in the **First Class with Distinction**.

24.2 Candidates who qualify for the award of the Degree (vide clause 23) 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 the **First Class**.

24.3 Candidates (not covered in vide clauses 24.1 and 24.2) who qualify for the award of the degree (vide Clause 23) shall be declared to have passed the examination in the **Second Class**.

25. RANKING

Candidates who qualify for the UG 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 VI/VIII 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.

26. 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.

27. DISCIPLINE

27.1. 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.

27.2. 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.

27. KAHE ENTRANCE EXAMINATION

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

28. REVISION OF REGULATION AND CURRICULUM

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

Annexure I

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

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

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

PROGRAM OUTCOMES

By the end of the programme, our graduates will

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

PROGRAM SPECIFIC OBJECTIVES (PSOs):

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

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

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

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

1. **PEO 1:** Design, model and develop smart applications by utilizing strong technical and domain knowledge acquired from the programme for the improvement of society.
2. **PEO 2:** Apply tools, technologies and critical thinking to develop applications for solving industry oriented problems
3. **PEO 3:** Function as a team member and develop projects in a multi-disciplinary environment by emulating leadership skills

MAPPING of PEOs and POs

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

DEPARTMENT OF COMPUTER APPLICATIONS
FACULTY OF ARTS, SCIENCE COMMERCE AND MANAGEMENT
UG PROGRAM (CBCS) – Bachelor of Computer Applications
(2024–2025 Batch and onwards)

Course code	Name of the course	Objectives and out comes		Instruction hours / week			Credit (s)	Maximum Marks			Category	Page No
		PE Os	POs	L	T	P		CIA	ESE	Total		
								40	60	100		
SEMESTER – I												
24LSU101	Language – I	2	2,6,1 1,12	4	-	-	3	40	60	100	AEC 1	1
24ENU101	English – I	2	2,7,1 2,14	3	-	-	3	40	60	100	MDC 1	6
24CAU101	Programming in C	1,2	1,3,4 ,5,8	4	-	-	3	40	60	100	Major 1	8
24CAU102	Numerical Methods	1,2	1,2,3 ,7,8, 9,11, 12	4	-	-	3	40	60	100	Minor 1	11
24CAU103	Digital Computer Fundamentals	1,2	1,3,4 ,5	4	-	-	3	40	60	100	Major 2	13
24CAU111	Programming in C - Practical	1,2	1,3,4 ,5,6	-	-	5	2	40	60	100	Major 3	15
24SEC101	Office Automation – Practical	1,2	1,4,5 ,6,10	-	-	4	2	40	60	100	SEC 1	18
24VAC101	Yoga for Youth Empowerment	3		2	-	-	2	40	60	100	VAC 1	23
Semester Total				21	0	9	21	320	480	800		
SEMESTER – II												
24LSU201	Language – II	2	2,6,1 1,12	4	-	-	3	40	60	100	AEC 2	24
24ENU201	English - II	2	2,12, 13,1 4	3	-	-	3	40	60	100	MDC 2	28
24CAU201	Object Oriented Programming	1,2	1,3,4 ,5,6, 9	5	-	-	4	40	60	100	Major 4	31
24CAU202	Discrete Structures	1,2	1,2,3 ,4	4	-	-	3	40	60	100	Minor 2	34
24CAU203	Data Structures and Algorithm Design	1,2	1,3,4 ,5,9	4	-	-	3	40	60	100	Major 5	36
24CAU211	Object Oriented Programming - Practical	1,2	1,3,4 ,9	-	-	4	2	40	60	100	Major 6	38
24SEC201	Web Programming -Practical	1,2	1,8,9 ,10	-	-	4	2	40	60	100	SEC 2	40
24VAC201	Environmental Studies	3		2	-	-	2	100	-	100	VAC 2	42

Semester Total					22	0	8	22	380	420	800		
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SEMESTER – III												
24LSU301	Language – III	2	2,6,1 1,12	4	-	-	3	40	60	100	AEC 3	43
24ENU301	English - III	2	2,9,1 1,12, 13,1 4	3	-	-	3	40	60	100	MDC 3	46
24CAU301	Operating System	1,2	1,4,5 ,9	5	-	-	4	40	60	100	Major 7	48
24CAU302	Computer Networks	1,2	1,3,4 ,5,8, 9,10, 11	4	-	-	3	40	60	100	Major 8	51
24CAU303	Operations Research	1,2	1,2,3 ,4,5, 6,7,8 ,9,10	4	-	-	3	40	60	100	Minor 3	53
24CAU311	Operating System – Practical	1,2	1,3,4 ,5,8, 9	-	-	4	2	40	60	100	Major 9	56
24CAU312	Computer Networks – Practical	1,2	1,3,4 ,5,9	-	-	4	2	40	60	100	Major 10	59
24VAC301	Indian Knowledge Systems	3		2	-	-	1	40	60	100	VAC 3	61
24CAU391	Internship*	1,2, 3		-	-	-	2	100		100	Sum mer Intern ship	62
Semester Total				22	0	8	23	320	480	900		
SEMESTER – IV												
24LSU401	Language – IV	2	2,6,1 1,12	4	-	-	3	40	60	100	AEC 4	63
24ENU401	Communicative English - IV	2	2,7,1 2,14	3	-	-	3	40	60	100	SEC 3	66
24CAU401	Programming in Python	1,2	1,3,4 ,9,10	4	-	-	3	40	60	100	Major 11	68
24CAU402	Network Security	1,2	1,3,4 ,5,9	4	-	-	3	40	60	100	Major 12	71
24CAU403	Relational Database Management Systems	1,2	1,3,4 ,5	3	-	-	2	40	60	100	Major 13	73
24CAU404	Probability and Statistics	1,2	1,2,3 ,4,7, 8,9,1 0	4	-	-	4	40	60	100	Minor 4	75
24CAU411	Programming in Python – Practical	1,2	1,4,5 ,8,9	-	-	3	2	40	60	100	Major 14	78
24CAU412	Network Security – Practical	1,2	1,5,9	-	-	3	2	40	60	100	Major 15	80
24VAC401	Universal Human Values	3		2	-	-	1	40	60	100	VAC 4	84
Semester Total				24	0	6	23	360	540	900		
SEMESTER – V												

24CAU501	Digital Identity Access Management	1,2	1,3,5,7,8,9,13	4			3	40	60	100	Major 16	85
24CAU502	Software Engineering and Sustainable Development Goals	1,2	1,2,3	4	-	-	3	40	60	100	Major 17	88
24CAU503A	PHP Programming	1,2	1,4,5,9,10	4	-	-	3	40	60	100	Major 18	91
24CAU503B	.Net Programming	1,2	1,3,5,9,10									93
24CAU504	Business Communication	3	1,2,3,5,10,14	4	-	-	3	40	60	100	Minor 5	96
24SEC511	CASE Tools– Practical	1,2				4	2	40	60	100	SEC 4	98
24CAU513A	PHP Programming – Practical	1,2	1,3,4,5,9,10	-	-	5	2	40	60	100	Major 19	100
24CAU513B	.Net Programming – Practical	1,2	1,3,4,9,10									102
24CAUE501	Elective Major	1,2		4			3	40	60	100	Major 20	104
24CAU591	Internship*	1,2,3		-	-	-	2	100		100	Summer Internship	105
Semester Total				20	0	9	21	380	420	800		

SEMESTER –VI

24CAU601	Cloud Computing	1,2	1,2,3,4,5,6,8,10	6	-	-	5	40	60	100	Major 21	106
24CAU602A	Block Chain Technology	1,2	1,3,4,5,6,8,9,10,13,15	6	-	-	4	40	60	100	Major 22	109
24CAU602B	Machine Learning	1,2	1,3,4,5,8,9,10									111
24CAU612A	Block Chain – Practical	1,2	1,3,4,5,6,7,8,10,11,15	-	-	4	2	40	60	100	Major 23	114
24CAU612B	Machine Learning – Practical	1,2	1,3,4,5,8,9,10									116
24CAUE601	Elective Minor	3		6			4	40	60	100	Minor 6	118
24CAU691	Project	1,2,3		-	-	8	6	40	60	100	Major 24	119
ECA / NCC / NSS / Sports / General interest etc		Good										
Semester Total				18	0	12	21	200	300	500		
Grand Total				128	0	52	132	1960	2640	4700		

SEMESTER –VII

24CAU701	Artificial Intelligence	1,2	1,3,4,5	6	-	-	6	40	60	100	Major 25	120
24CAU702	Text Analytics	1,2	1,4,5	6	-	-	6	40	60	100	Major 26	122
24CAU703	Statistical Computing	1,2	1,4,5,6	6	-	-	5	40	60	100	Minor 7	124
24CAU711	Artificial Intelligence – Practical	1,2	1,4,5,9	-	-	6	3	40	60	100	Major 27	127
24CAU712	Text Analytics – Practical	1,2	1,3,4,5,9,14,15	-	-	6	3	40	60	100	Major 28	129
Semester Total				18	-	12	23	200	300	500		
SEMESTER -VIII A												
24CAU801	Data Visualization	1,2	1,3,4,5,7,14	6	-	-	4	40	60	100	Major 29	131
24CAU802	Advanced Java	1,2	1,4	6	-	-	4	40	60	100	Major 30	133
24CAU803	Organizational Behavior	3	1,2,3,4,5,7,9,11,12,13,14,15	6	-	-	3	40	60	100	Minor 8	135
24CAU811	Data Visualization -Practical	1,2	1,2,3,4,5,6,8,9,10	-	-	6	4	40	60	100	Major 31	137
24CAU812	Advanced Java – Practical	1,2	1,3,4,5,6,8,9,10	-	-	6	4	40	60	100	Major 32	139
Semester Total				18	0	12	19	200	300	500		
SEMESTER -VIII -B												
24CAU801	Research Methodology and IPR	1,2	1,3,4,5,6,8,10	6	-	-	4	40	60	100	Major 33	141
24CAU811	SPSS - Practical	1,2	1,3,4,5,9	-	-	6	3	40	60	100	Minor 8	143
24CAU911	Research Project/Preparation of Research Project	1,2		-	-	18	12	100	200	300	Major 34	145
Semester Total				6	0	24	19	180	320	500		
	Grand Total			170	-	100	193	2540	3560	6200		

Ability Enhancement Courses (AEC)		
Semester	Course Code	Name of the Course
I	24LSU101	Language –I
II	24LSU201	Language –II
III	24LSU301	Language –III
IV	24LSU401	Language –IV

Multi-Disciplinary Course (MDC)		
Semester	Course Code	Name of the Course
I	24ENU101	English – I
II	24ENU201	English – II
III	24ENU301	English – III

Major		
Semester	Course Code	Name of the Course
I	24CAU101	Programming in C
	24CAU103	Digital Computer Fundamentals
	24CAU111	Programming in C – Practical
II	24CAU201	Object Oriented Programming
	24CAU203	Data Structures and Algorithm Design
	24CAU211	Object Oriented Programming - Practical
III	24CAU301	Operating System
	24CAU302	Computer Networks
	24CAU311	Operating System – Practical
	24CAU312	Computer Networks – Practical
IV	24CAU401	Programming in Python
	24CAU402	Network Security
	24CAU403	Relational Database Management Systems
	24CAU411	Programming in Python – Practical
	24CAU412	Network Security – Practical
V	24CAU501	Digital Identity Access Management
	24CAU502	Software Engineering and Sustainable Development Goals
	24CAU503A	PHP Programming
	24CAU503B	.Net Programming
	24CAU513A	PHP Programming – Practical
	24CAU513B	.Net Programming – Practical
	24CAUE501	Elective Major
VI	24CAU601	Cloud Computing

	24CAU602A	Block Chain Technology
	24CAU602B	Machine Learning
	24CAU612A	Block Chain – Practical
	24CAU612B	Machine Learning – Practical
	24CAU691	Project
VII	24CAU701	Artificial Intelligence
	24CAU702	Text Analytics
	24CAU711	Artificial Intelligence – Practical
	24CAU712	Text Analytics – Practical
VIII A	24CAU801	Data Visualization
	24CAU802	Advanced Java
	24CAU811	Data Visualization -Practical
	24CAU812	Advanced Java – Practical
VIII B	24CAU801	Research Methodology and IPR
	24CAU911	Research Project/Preparation of Research Project

Minor		
Semester	Course Code	Name of the Course
I	24CAU102	Numerical Methods
II	24CAU202	Discrete Structures
III	24CAU303	Operations Research
IV	24CAU404	Probability and Statistics
V	24CAU504	Business Communication
VI	24CAUE601	Elective Minor
VII	24CAU703	Statistical Computing
VIII A	24CAU803	Organizational Behaviour
VIII B	24CAU811	SPSS - Practical

Skill Enhancement Courses (SEC)
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Semester	Course Code	Name of the Course
I	24SEC101	Office Automation – Practical
II	24SEC201	Web Programming -Practical
IV	24ENU401	Communicative English – IV
V	24SEC511	CASE Tools– Practical

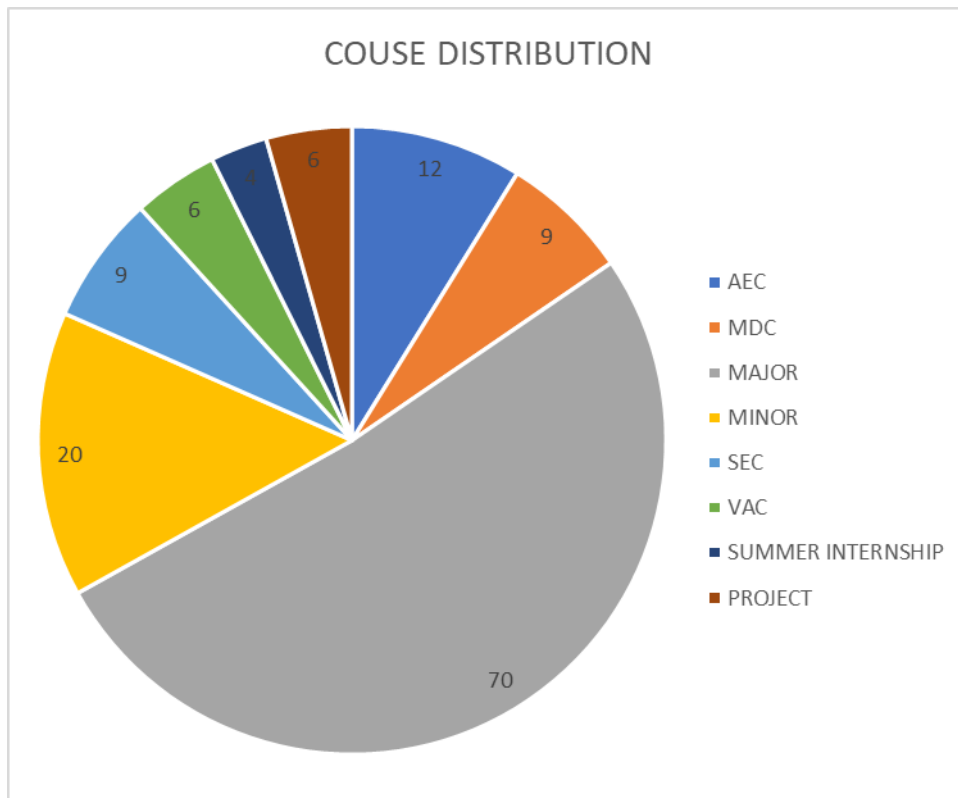
Value Added Courses (VAC)		
Semester	Course Code	Name of the Course
I	24VAC101	Yoga for Youth Empowerment
II	24VAC201	Environmental Studies
III	24VAC301	Indian Knowledge Systems
IV	24VAC401	Universal Human Values

Summer Internship		
Semester	Course Code	Name of the Course
III	24CAU391	Summer Internship*
V	24CAU591	Summer Internship*

Course Distribution Table

Category	No of Courses		Total
	Theory	Practical	
AEC	4	0	4
MDC	3	0	3
MAJOR	15	9	24
MINOR	6	0	6
SEC	1	3	4
VAC	4	0	4
SUMMER INTERNSHIP	0	2	2
PROJECT	0	1	1
Total	33	15	48

Course Distribution



முதல் பருவம்

பகுதி - I, தமிழ், தாள் 1

4H-3C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

பாடத்திட்டப் பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.
- ஆய்வுநோக்கை மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.
- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல். அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப் பயன்விளைவு

- இந்தியக் குடியரிமைப்பணி முதலான போட்டித் தேர்வுகளில், விருப்பப்பாடமாக இடம்பெறுகின்ற, 'தமிழ்இலக்கியவரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
- கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வு மனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
- தமிழின் வளர்ச்சித்துறையாகிய, 'அறிவியல்தமிழ்'; 'இணையதமிழ்' குறித்த பன்னோக்கு அணுகுமுறையிலான ஆய்வுச்சிந்தனை மேம்பாடு.
- வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
- சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி. மொழிபெயப்புத் துறைசார்ந்த வேலைவாய்ப்புத்திறன் பெற்றிருத்தல்

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1											S				
CO2												S			
CO3						M									
CO4		M													
CO5		S													

S-Strong; M-Medium; L-Low

அலகு - I

(10 மணிநேரம்)

சங்க இலக்கியம் - எட்டுத்தொகை - முச்சங்கங்கள் பற்றிய செய்திகள்- சங்க இலக்கியத்தின் தோற்றுவாய் - எட்டுத்தொகை அறிமுகம்.சங்க இலக்கியம் - நற்றிணை - நின்ற சொல்லர் -குறிஞ்சி - தலைவி கூற்று-1 சங்க இலக்கியம் - குறுந்தொகை - நிலத்தினும் பெரிதே-குறிஞ்சி - தலைவி கூற்று- 3 அறஇலக்கியம் - திருவள்ளுவர் - திருக்குறள் (எண்கள்-திருக்குறள் வரிசை எண்ணைக் குறிப்பன)

பாயிரம் - 8 அறவாழி அந்தணன்,13 - விண்ணின்று பொய்ப்பின், 34 - மனத்துக்கண் மாசிலன் ஆதல்

இல்லற இயல் - இல்வாழ்க்கை - 41- அன்பும் அறனும் உடைத்த 50- வையத்துள்வாழ்வாங்கு

அன்புடைமை - 80 - அன்பின்வழியது

விருந்தோம்பல் - 90 - மோப்பக்குழையும்

இனியவைகூறல் - 95 - பணிவுடையன் இன்சொலன்

செய்நன்றி அறிதல் - 103 - பயன் தூக்கார்

புறங்கூறாமை - 190 - ஏதிலார் குற்றம்

ஒப்புரவுஅறிதல் - 216 - பயன்மரம்

ஈகை: 228 - ஈத்துவக்கும் இன்பம்

துறவற இயல் - தவம் - 261 - உற்றநோய்

வாய்மை - 291 - வாய்மை எனப்படுவது

வெகுளாமை - 306 - சினமென்னும்

இன்னாசெய்யாமை : 316-இன்னா எனத்தான் உணர்ந்தவை

நிலையாமை - 331 - நில்லாதவற்றை

ஊழியல் - ஊழ் - 373 - நுண்ணியநூல்

ஆள்வினை உடைமை - 618 -பொறியின்மை யார்க்கும், 620-ஊழையும் உப்பக்கம்

நட்பு - 792-ஆய்ந்தாய்ந்து, 794-குடிப்பிறந்து, 797-ஊதியம் என்பது

காப்பியம் - சிலப்பதிகாரம்:

மங்கலவாழ்த்துப் பாடல் - பொதியில்ஆயினும் - 'கோவலன் என்பான்மன்னோ' (14-38), 'நீலவிதானத்து' - 'நோன்புஎன்னை'(48-53).

மனையறம்படுத்த காதை - 'வார்ஓலிகூந்தலை' - 'சிறப்பின் கண்ணகிதனக்குஎன்' (84-90)

அரங்கேற்று காதை - 'மாமலர்நெடுங்கண்' - 'அகம்மறந்து' (170-175).

மதுரைக்காண்டம் - கொலைக்களக்காதை : 'இருமுதுகுரவர்' - 'எழுந்தனன்யான்' (67-83), 'வினைவிளைகாலம்' - 'கொணர்கஈங்குஎன்' (148-153)

கட்டுரை காதை - 'கடிபொழில்' - 'இல்சாபம்பட்டனிர்' (138-170)

வழக்குரைக் காதை - 'அல்லவை செய்தார்க்கு' - 'தோற்றான்உயிர்' (82-93)

வஞ்சிக் காண்டம் - நடுகல்காதை - 'மதுரைமுதார்' - 'மன்னவர்ஏறு' (218-234)

வாழ்த்துக் காதை - 'என்னேஇஃது' - 'தோன்றுமால்' (9)

எழுத்திலக்கணம் - முதல் மற்றும் சார்பெழுத்துகள்

அலகு- 2

(10 மணிநேரம்)

சங்க இலக்கியம் - பத்துப்பாட்டு அறிமுகம்

சங்க இலக்கியம் - பதிற்றுப்பத்து : ஏழாம்பத்து- எறிபிணம் இடறிய செம்மறுக்- 65

சங்க இலக்கியம் - கலித்தொகை : அகன்ஞாலம் விளக்கும் - நெய்தல்கலி - தலைவிகூற்று- 119.

அற இலக்கியம் -முன்றுறையரையனார் - பழமொழி நானூறு 5 பாடல்கள்

காப்பியம் -மணிமேகலை : விழாவறைகாதை : 'தேவரும் மக்களும்' - 'மருங்குஎன்' (66-72)

ஊரலர் உரைத்தகாதை : 'நாவல்ஓங்கிய' - 'உண்டுகொல்'(1-17), 'கற்றுத்துறைபோகிய' - 'தீத்தொழில்படாஅள்' (32-57).

பாத்திரம் பெற்றகாதை : 'போதிநீழல்' - 'நல்அறம்கண்டனை' (73-98)

சிறைக்கோட்டம் அறக்கோட்டம் ஆக்கியகாதை - 'வாழிஎம்கோ' - 'அரசுஆள்வேந்துஎன்' (129-163)

சொல்லிலக்கணம் - பெயர், வினை, இடை, உரிச்சொல்-விளக்கமும்பயிற்சியும்

அலகு- 3

(10 மணிநேரம்)

அறஇலக்கியங்கள் அறிமுகம்

சங்க இலக்கியம் - பரிபாடல்: வையை : பாடல்-6. -நிறைகடல் முகந்து உராய் - சேறுஆடுபுனலதுசெலவு 1-50.

சங்க இலக்கியம் -அகநானூறு - ஈன்று புறம்தந்த எம்மும் உள்ளாள் - பாலை - நற்றாய்கூற்று-35

அற இலக்கியம் -ஒளவையார்- கொன்றை வேந்தன் (1-50 பாடல்கள்)

காப்பியம் - சூளாமணி-அரசியல்சருக்கம்- 1. நாவினே கமழும்(1131), 2. கண்மிசை கனிந்த (1132),3. விரைசெலலிவுளித்(1133), 4. அரைசர்கள் வருக (1134), 5. அருளுமாறடிகள் (1135), 6. விஞ்சையருலக (1136), 7. சொரிகதிர் (1137), 8. கரியவன் வளைந்த(1138), 9. மடித்தவா யெயிறு (1139),10. விஞ்சயரதனைக் (1140), **துறவுச்சருக்கம்** - பயாபதி மன்னின் துறவுநெறி -1. மன்னிய புகழி(1840), 2. திருமகிலங்கன் (1841) , 3. ஆங்கவ ரணைந்த (1842), 4. அலகுடன் விளங்கு (1843), 5. தன்னையோர் அரசனாக்கி (1844), 6. சென்றநாள்(1845), 7. எரிபுரை (1846.), 8. பிறந்தனர்(1847), 9. பிறந்தநாம் (1848), 10. தொகைமலர் (1849) 11. ஒழுகிய(1850) **பொருள் இலக்கணம்** - அகத்திணை மற்றும் புறத்திணை இலக்கணங்கள்.

அலகு- 4

(10 மணிநேரம்)

சிறிலக்கியங்கள் தோற்றமும் வளர்ச்சியும் **சங்க இலக்கியம் - ஐங்குறுநூறு** : தாய்சாப்பிறக்கும் - தோழிகூற்று - மருதம் - களவன்பத்து: 24

சங்க இலக்கியம் - புறநானூறு : உற்றுழிஉதவியும்-183, பல்சான்றீரே - பொதுவியல்-195

அற இலக்கியம் - வேதநாயகம் பிள்ளை -நீதி நூல்- தேர்ந்தெடுக்கப்பட்ட 5 பாடல்கள் மட்டும்

சின்னவோர் பொருள், கடவுளை வருத்தி, எப்புவிசளும், வைத்தவர், ஈன்றவர்காப்பியம் - கம்பராமாயணம் - சுந்தரகாண்டம் (தேர்ந்தெடுக்கப்பட்ட பாடல்கள் மட்டும்) வண்மையில்லை- தாய் ஒக்கும்- ஒரு பகல்- எதிர் வரும்- தருவனத்துள்- எண் இலா -சொல் ஒக்கும்- இவ்வண்ணம்-

எண் அரு- தடுத்து இமையாமல்- தோள் கண்டார்- மைந்தரை- அந்நகர்- சிவந்த வாய்- ஏய வரங்கள்- நின்மகன்- ஆழிசூழ்- மன்னவன்- பின்னும்- கிள்ளையொடு- எந்தையும்- பஞ்சி ஒளிர்- மயில் உடை- ஆண்டு -மற்றுஇனி-கண்டனன்- வேலையுள்-மண்ணொடும்- வாங்கிய- இங்குஉள- கண்டனென்- பைய பைய- அந்நெறி- குகனொடும்-கூவி-மாக்கூடு- அற்றவன்- ஆள் ஐயா-கார்நின்ற.

கடிதப்பயிற்சி

1. வேலைவேண்டி விண்ணப்பம் எழுதுதல்
2. பல்கலைக்கழகப் பன்னாட்டுக் கருத்தரங்கச் செய்தியை நாளிதழில் வெளியிட வேண்டி நாளிதழின் பதிப்பாசிரியருக்குக் கடிதம்
3. கருத்தரங்கப் பங்கேற்புக்கான அனுமதிக்கடிதம்
4. பல்கலைக்கழக விழாவுக்குத் தலைமையேற்க வேண்டி, மாவட்ட ஆட்சியருக்கு விண்ணப்பம்

அலகு - 5

(08 மணிநேரம்)

காப்பியங்கள் - தோற்றமும் வளர்ச்சியும்

சங்க இலக்கியம் - பத்துப்பாட்டு: சிறுபாணாற்றுப்படை

வானம் வாய்த்த - யாம் அவண்ணின்றும் வருதும் (அடிகள்: 84-143),

செய்நன்றி அறிதலும் - நல்லியக்கோடனை நயந்தனிர் செலினே (207-269).

அற இலக்கியம் - குமரகுருபரர் - நீதி நெறி விளக்கம் (தேர்ந்தெடுக்கப்பட்ட 5 பாடல்கள் மட்டும்) உறுதி பயப்ப, முயலாது வைத்து, உலையாமுயற்சி, காலம் அறிந்து, மெய்வருத்தம்

கடிதப்பயிற்சி

5. கல்விக் கடன்வேண்டி வங்கிமேலாளருக்கு விண்ணப்பம்
6. வசிப்பிடத்திற்கு அடிப்படை வசதிவேண்டி வட்டாட்சியருக்கு விண்ணப்பம்
7. விருதுபெற்ற நண்பனுக்குப் பாராட்டுக் கடிதம்
8. புத்தகங்கள் அனுப்பி உதவவேண்டி, பதிப்பகத்தாருக்கு விண்ணப்பம்

SEMESTER-I
PART II ENGLISH I

3H-3C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To enable the learner to communicate effectively and appropriately in real life situation
- To develop and integrate the use of the four language skills.
- To give basic knowledge on grammar.
- To train students to acquire proficiency in English by reading different genres of literature and learning grammar.
- To identify the meaning of words using context clues.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Retrieve fundamentals of English language to construct error free sentences.	Apply
CO2	Discover the knowledge of interpersonal skills.	Analyze
CO3	Construct and maintain social relationships.	Apply
CO4	Classify communication skills in business environment.	Understand
CO5	Explain communication competency through LSRW skills.	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1		S													
CO2		S					M								
CO3		S					S								
CO4		S										L		M	
CO5		S												L	

S-Strong; M-Medium; L-Low

UNIT I **7 HOURS**

LISTENING: Listening –Types of Listening
SPEAKING: Face to Face Conversation
READING: Reading – Types of Reading
WRITING: Jumbled Sentences
LITERATURE: Ode on a Grecian Urn by John Keats
GRAMMAR: Parts of Speech

UNIT II **7 HOURS**

LISTENING: Principles of Listening Skills
SPEAKING: Descriptions
READING: Reading Techniques
WRITING: Paragraph Writing
LITERATURE: Of Friendship by Francis Bacon
GRAMMAR: Articles

UNIT III **7 HOURS**

LISTENING: Barriers of Listening
SPEAKING: Telephone Conversations
READING: Reading Comprehension Passages
WRITING: Precise Writing
LITERATURE: The Umbrella man by Roald Dahl
GRAMMAR: Tense

UNIT IV **7 HOURS**

LISTENING: Story Narrations
SPEAKING: Group Discussion
READING: Reading Reports and Profiles
WRITING: Letter Writing
LITERATURE: Tyger by William Blake
GRAMMAR: Subject and Predicate – Question Tags

UNIT V **8 HOURS**

LISTENING: Listening Strategies
SPEAKING: Interview Skills
READING: Tips for MOC- Anchoring
WRITING: Circular Writing and Summary Writing
LITERATURE: Short story: Rapunzel by the Brothers Grimm
GRAMMAR: Framing Questions

SUGGESTED READINGS

- 1 Wren & Martin, 2008, *High School English Grammar & Composition*, S.Chand & Company Ltd, Board of Editors,
- 2 Krashen, Stephen D (1982) *Principles and practice in second language acquisition*. New York: Pergamon Press.

SEMESTER-I
PROGRAMMING IN C

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

- The objective of this course is to provide the knowledge about C fundamentals.
- The student will learn the Concepts and techniques in the C Programming.
- The student will understand the concepts of Arrays and User-Defined Functions
- The student can able to understand the concepts of Pointers, Structures and Unions
- The student can able to develop program using File Management.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Understand the fundamental knowledge of C.	Understand
CO2	Apply the concepts of programming with C through Decision making and Looping.	Apply
CO3	Understand how to apply the major concepts to implement Problem Solving by Arrays and User-Defined Functions.	Apply
CO4	Understand the Program development using Pointers, Structures and Unions.	Analyze and Create
CO5	Create programs using File Management.	Apply and Create

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S														
CO2	S		M	S	S			M							
CO3	S		M	S	S			M							
CO4	S		M	S	S			M							
CO5	S		M	S	S			M							

S-Strong; M-Medium; L-Low

UNIT I: OVERVIEW OF C**10 HOURS**

Overview of C - Introduction – History of C-Features of C-Structure and Execution of C-Character set - C tokens - keyword & Identifiers - Constants - Variables - Data types - Declaration of variables - Assigning values to variables – Defining Symbolic Constants - Arithmetic, Relational, Logical, Assignment, Conditional, Bitwise, Special, Increment and Decrement operators-Arithmetic Expressions Evaluation of expression- precedence of arithmetic operators - Type conversion in expression – operator precedence & associativity-Mathematical functions- Reading & Writing a character-Formatted input and output.

UNIT II: DECISION MAKING AND LOOPING**8 HOURS**

Decision Making, Looping and Arrays: Introduction – if, if... else, nesting of if ...else statements- else..if ladder – The switch statement, The ?: Operator – The goto Statement. Decision Making and Looping: Introduction- The while statement- the do statement – the for statement-jumps in loops.

UNIT III : ARRAYS AND USER-DEFINED FUNCTIONS**10 HOURS**

Arrays- Arrays–Character Arrays and Strings. User-Defined Functions: User-Defined Functions: Introduction–Need and Elements of User-Defined Functions-Definition-Return Values and their types-Function Calls–Declarations–Category of Functions-Nesting of Functions-Recursion– Passing Arrays and Strings to Functions- The Scope, Visibility and Lifetime of Variables.

UNIT IV: POINTERS, STRUCTURES AND UNIONS**10 HOURS**

Pointers: Introduction-Understanding pointers -Accessing the address of a variable Declaration and Initialization of pointer Variable – Accessing a variable through its pointer Chain of pointers-Pointer Expressions – Pointer Increments and Scale factor- Pointers and Arrays- Pointers to Functions–Pointers and Structures -Structures and Unions.

UNIT V: FILE MANAGEMENT**10 HOURS**

File Management in C: Introduction-Understanding File Management-Defining and Opening a file-Closing a File-IO Operations on file-Error Handling during IO Operation-Random Access to files-Command Line Arguments – Macros – types of macros.

SUGGESTED READINGS

1. E. Balagurusamy, 2018. Programming in ANSI C, 7th Edition.

2. Brian W. Kernighan and Dennis M. Ritchie, 2015.The C Programming Language, 2nd Edition.
3. Stephen G. Kochan,2014. Programming in C, 4th Edition.
4. E Balagurusamy, 2008.Computing Fundamentals & C Programming, Tata McGraw-Hill, Second Reprint.
5. Behrouz A. Forouzan and Richard F. Gilberg, 2000.Computer Science: A Structured Programming Approach Using C, 3rd Edition.
6. Herbert Schildt, 2000.C: The Complete Reference, 4th Edition.

WEBSITES

1. Introduction to Programming in C-NPTEL
2. Problem solving through Programming in C -SWAYAM
3. C for Everyone: Programming Fundamentals-Coursera
4. <https://www.w3schools.com/c/>
5. <https://www.youtube.com/watch?v=5Bn8h6Id14U>
6. <https://www.javatpoint.com/c-programming-language-tutorial>

SEMESTER-I
NUMERICAL METHODS

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 (CO)

- To introduce numerical solutions of algebraic and transcendental equations.
- To provide efficiency of iteration methods.
- To acquaint the knowledge of interpolation concepts.
- To familiarize numerical integration and differentiation.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations and integration.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Apply numerical analysis which has enormous application in the field of science.	Apply
CO2	Compute iteration method's effectiveness.	Analyze
CO3	Appreciate the numerical techniques of interpolation.	Understand
CO4	Categorize information on numerical differentiation and integration.	Analyze
CO5	Develop and apply the various techniques and methods for solving ordinary differential equations.	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	S	S	M	-	-	-	M	L	L	-	M	S	M	-	-	-
CO2	S	S	M	-	-	-	M	L	L	-	M	S	M	-	-	-
CO3	S	S	M	-	-	-	M	L	L	-	M	S	M	-	-	-
CO4	S	S	M	-	-	-	M	L	L	-	M	S	M	-	-	-
CO5	S	S	M	-	-	-	M	L	L	-	M	S	M	-	-	-

S-Strong; M-Medium; L-Low

UNIT I: 10 HOURS

The Solutions of Numerical Algebraic and Transcendental equations: Bisection method -Iteration method- False Position method - Newton's method.

UNIT II: 10 HOURS

Solution of Simultaneous Linear algebraic Equation – Gauss elimination method- Gauss Jordan method- Gauss Jacobi method- Gauss Seidel methods.

UNIT III: 10 HOURS

Interpolation: Gregory-Newton forward and backward interpolation Formula– equidistant terms with one or more missing values - Lagrange and Inverse Lagrange Interpolation formula.

UNIT IV: 9 HOURS

Numerical Differentiation: Newton 's forward Difference and Newton 's Backward Difference formula. Numerical Integration: Trapezoidal Rule & Simpson 's Rule.

UNIT V: 9 HOURS

Numerical Solution of Ordinary Differential Equations: Taylor's series - Euler's method – Modified Euler's method - Runge-Kutta methods (fourth order Runge - Kutta method only).

SUGGESTED READINGS

1. Kandasamy P., Dr. Bhagavathi K., and Dr. Gunavathi K., (2015). Numerical Methods, Published by Chand & Company Pvt. Ltd., New Delhi.
2. Jain M.K., Iyengar S.R.K., and Jain R.K. (2012). Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, New Delhi.
3. Veera Rajan T., and Ramachandran T., (2008). Numerical Methods with Programs in C, Tata McGraw-Hill Publishing company limited, New Delhi.
4. Bradie B., (2007). A Friendly Introduction to Numerical Analysis, Pearson Education, India.

WEBSITES

1. <https://testbook.com/maths/bisection-method>
2. <https://kanchiuniv.ac.in/coursematerials/Numerical%20-%20Algebraic%20equations.pdf>
3. <https://youtu.be/TIWRyzzFUYQ?si=rK4kUBpTzVpavVdU>
4. <https://theengineeringmaths.com/wp-content/uploads/2017/11/num-diff-integ-web.pdf>

SEMESTER-I
DIGITAL COMPUTER FUNDAMENTALS

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 (CO)

- To Understand the basic components of computer system and number system
- To Enable to analyse the distinctive features of Boolean algebra and logical gates.
- To Apply the logical expression of SOP and POS techniques
- To Design the various types of flip flops, registers and counters.
- To Understand the concept of register and memory unit

Course Outcomes (COs)

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

COs	Course Outcomes	Blooms Level
CO1	Understand the basic components of computer system and number system.	Understand
CO2	Analyse the distinctive features of Boolean algebra and logical gates.	Analyze
CO3	Apply the logical expression of SOP and POS techniques.	Apply
CO4	Understand the various types of flip flops, registers and counters.	Understand
CO5	Understand the concept of register and memory unit.	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S			L											
CO2	S			L	S										
CO3	S		S	S											
CO4	S				M										
CO5	S				M										

S-Strong; M-Medium; L-Low

UNIT – I: INTRODUCTION **9 HOURS**

Application of Computer - Different types of Computer systems - Basic components of Digital Computer System - Programming Languages; Number Systems.

UNIT – II: BOOLEAN ALGEBRA AND GATE NETWORKS **10 HOURS**

Fundamentals concepts of Boolean Algebra – Logical Multiplication AND Gates, OR Gates, and Inverters – Evaluation of logical Expressions – Basic Law of Boolean Algebra – Simplification of expressions – De Morgan’s theorems – Basic Duality of Boolean Algebra - Derivation of a Boolean Expression.

UNIT - III: INTERCONNECTING GATES **10 HOURS**

Sum of products (SOP) and Products of sums (POS) – Derivation of products of sums expressions – Derivation of three Input variable expression – NAND gates and NOR gates - The Map method for simplifying expressions – Sub cube and covering – product of sums expressions – Don’t cares.

UNIT – IV: COMBINATION OF LOGIC CIRCUITS **10 HOURS**

Half Adder- Full adder- Half Subtractor – Full Subtractor- Encoder-Decoder Multiplexer- Demultiplexer- -Sequential Circuits-Flipflops: Basic of Flipflops-SR Flipflops-JK Flipflops-D Flipflops-T Flipflops- Edge triggered Flipflops – Master-slave Flip-flops.

UNIT -V: REGISTER, COUNTER AND MEMORY UNIT **9 HOURS**

Register: Introduction- Types of Register- Counter: Introduction- Asynchronous or ripple counters Asynchronous or ripple counters Memory: Introduction - Magnetic Memory - Optical Memory - Memory Addressing - ROMs, PROMs, EPROMs and EEPROM.

SUGGESTED READINGS

- 1 M. Morris Mano, 2018. Digital Logic and Computer Design, 7th Edition Pearson India Education Services Pvt. Ltd Publisher.
- 2 William Stallings, 2016. Computer Organization and Architecture 10th Edition ©. Pearson Education, Inc., Hoboken, NJ. Al.
- 3 Floyd, Thomas 2010. L. Digital Fundamentals Prentice-Hall.
- 4 Malvino, Paul Albert and Leach, Donald P, 2000. “Digital Principles and Applications” 4th Edition, TMH.
- 5 Bartee 1991. Digital Computer Fundamentals. Thomas T.M.H Publisher 6th Edition, New Delhi.

WEBSITES

- 1 https://nios.ac.in/media/documents/vocational/CLS/Certificate_Course_in_Library_Science_english/M4_PDF/M4L1.pdf
- 2 https://www.tutorialspoint.com/computer_fundamentals/computer_fundamentals_tutorial.pdf
- 3 <https://www.javatpoint.com/digital-computers>

SEMESTER-I
PROGRAMMING IN C 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

- The objective of this course is to provide the knowledge about structure of C Programming.
- The student will implement the Concepts and programming techniques in C.
- The student will equip and indulge themselves in problem solving using C.
- The student will develop the programs using User-Defined Functions, Structures and Unions
- The student can able to build the programs using User-Defined Functions, Structures and Unions
- The student can able to develop programs using Pointers & File Management.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Understand the fundamental knowledge of C Programming Structure	Understand
CO2	Apply the concepts of programming with C .	Apply
CO3	Understand how to apply the major concepts to implement Problem Solving using C.	Apply
CO4	Develop the Programs using User-Defined Functions, Structures and Unions.	Analyze and Create
CO5	Develop programs using Pointers & File Management.	Apply and Create

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S														
CO2	S		S	S	S	L									
CO3	S		S	S	S	L									
CO4	S		S	S	S	L									
CO5	S		S	S	S	L									

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS

60 HOURS

1. Write a C program to find the sum, average, standard deviation for a given set of numbers.
2. Write a C program to generate n prime, perfect, Armstrong numbers.
3. Write a C program to generate Fibonacci series.
4. Write a C program to print magic square of order n where $n > 3$ and n is odd.
5. Write a C program to sort the given set of numbers in ascending order.
6. Write a C program to check whether the given string is a palindrome or not using pointers.
7. Write a C program to count the number of Vowels in the given sentence.
8. Write a C program to find the factorial of a given number using recursive function.
9. Write a C program to print the students Mark sheet assuming roll no, name, and marks in 5 subjects in a structure. Create an array of structures and print the mark sheet in the University pattern.
10. Write a function using pointers to add two matrices and to return the resultant matrix to the calling function.
11. Write a C program which receives two filenames as arguments and check whether the file contents are same or not. If same delete the second file
12. Write a program which takes a file as commandline argument and copy it to another file. At the end of the second file write the total i) no. of chars ii) no. of words and iii) no. of lines.

SUGGESTED READINGS

1. E. Balagurusamy, 2018. Programming in ANSI C, 7th Edition.
2. Stephen G. Kochan, 2014. Programming in C, 4th Edition.
3. E Balagurusamy, 2008. Computing Fundamentals & C Programming, Tata McGraw-Hill, Second Reprint.
4. Behrouz A. Forouzan and Richard F. Gilberg, 2000. Computer Science: A Structured Programming Approach Using C, 3rd Edition.

5. Herbert Schildt, 2000.C: The Complete Reference, 4th Edition.
6. Brian W. Kernighan and Dennis M. Ritchie, 1988.The C Programming Language, 2nd Edition.

WEBSITES

1. www.programmingsimplified.com
2. [www.programiz.com / c-programming](http://www.programiz.com/c-programming)
3. www.cplusplus.com
4. www.learncpp.com
5. www.udemy.com
6. www.hackerrank.com
7. www.leetcode.com
8. www.codewars.com.com
9. www.codechef.com
10. www.topcoder.com

SEMESTER-I
OFFICE AUTOMATION - 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 documentation.
- To Perform simple mathematical equation.
- To Perform presentation skill.
- To Study concepts of Libre office, Spreadsheets, Presentation Tools.
- To Demonstrate the ability to apply application software in an office environment.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Create and format documents to meet specific layout requirements, including margins, headings, and columns.	Create
CO2	Create tables with formulas for calculations such as total, average, and round functions	Create
CO3	Design professional presentations with appropriate slide formatting, tables, bullets, and numbering.	Apply
CO4	Develop custom animations and slide transitions to improve the visual appeal of presentations.	Create
CO5	Create and manage databases with tables containing various data types and set primary keys.	Create

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S									M					
CO2	S			L						M					
CO3	S									M					
CO4	S					L				M					
CO5	S				M					M					

S-Strong; M-Medium; L-Low

PROGRAMS (MS Word)

- 1. Create a news-paper document with at least 200 words,**
 - i. Use margins as, top:1.5, bottom:2, left:2, right:1 inches.
 - ii. Use heading “Gandhi Jayanti”, font size: 16, font color: red, font face: Arial Black.
 - iii. With first letter “dropped” (use drop cap option) of the first paragraph containing a picture at the right side
 - iv. Use three columns from the second paragraph onwards till the half of the page.
 - v. Then use heading “Computer basics”
 - vi. Create paragraph using two columns till the end of the page.
- 2. Create a Mathematical question paper using, at least five equations**
 - i. With fractions, exponents, summation function
 - ii. With at least one „m*n“ matrix
 - iii. Basic mathematical and geometric operators.
 - iv. Use proper text formatting, page color and page border.
- 3. Create a flowchart using,**
 - i. Proper shapes like ellipse, arrows, rectangle, and parallelogram.
 - ii. Use grouping to group all the parts of the flowchart into one single object.
- 4. Create a table using table menu with,**
 - i. At least 5 columns and 10 rows.
 - ii. Merge the first row into one cell.
 - iii. Merge the second row into one cell, then split the second row into three cells.
 - iv. Use proper table border and color.
- 5. Create a table using two columns,**
 - i. The left column contains all the short-cut keys and right side column contains the function of the short-cut keys.
 - ii. Insert a left column using layout option. Name the heading as Serial No.
- 6. Create two letters with the following conditions in Ms Word and find the difference.**
 - i. Write a personal letter to your friend using at least 100 words and two paragraphs. The date must be in top-right corner. Use „justify“ text- alignment and 1.5 line spacing for the body of the letter. Letter must contain proper salutation and closing.
 - ii. Use step by step mail-merge wizard to design a letter. (Mailing à step by step mail merge wizard letters start from a template select template à letters à select proper template create new documentation OK)

7. Create a letter, which must be sent to multiple recipients.

- i. Use Mail-Merge to create the recipient list.
- ii. Use excel sheet to enter the recipient.
- iii. Start the mail merge using letter and directory format. State the difference.

PROGRAMS (MS Excel)

1. Create a table “Student result” with following conditions.

- i. The heading must contain, Sl. No., Name, Mark1, Mark2, Mark3, Total, average and result with manual entry.
- ii. Use formulas for total and average.
- iii. Find the name of the students who has secured the highest and lowest marks.
- iv. Round the average to the nearest highest integer and lowest integer (use ceiling and floor function respectively).

2. Do as directed

- i. Create a notepad file as per the following fields

Slno name th1 th2 th3 th4 th5 total % grade

- ii. Grade is calculated as,
 - a. If % \geq 90, then grade A
 - b. If % \geq 80 and $<$ 90, then grade B
 - c. If % \geq 70 and $<$ 80, then grade C
 - d. If % \geq 60 and $<$ 70, then grade D
 - e. If % $<$ 60, then grade F

3. Create a sales table using the following data

Item	Year1	Year2	Year3	Year4
Item1	1000	1050	1100	1200
Item2	950	1050	1150	1200
Item3	1100	1200	1200	1300

- i. Draw the bar-graph to compare the sales of the three items for four years using insert option.
- ii. Draw a line-graph to compare the sales of three items for four years using insert option.
- iii. Draw different pie-charts for the given data using insert option.
- iv. Use condition, to highlight all the cells having value \geq 1000 with red color (use conditional formatting).

PROGRAMS (MS Power Point)

1. Create a power-point presentation with minimum 5 slides.

- i. The first slide must contain the topic of the presentation and name of the presentation. Must contain at least one table.
- ii. Must contain at least 5 bullets, 5 numbers.
- iii. The heading must be, font size:32, font-face: Arial Rounded MT Bold, font-color: blue.

2. Create a power-point presentation with minimum 10 slides

- i. Use word art to write the heading for each slides.
- ii. Insert at least one clip-art, one picture
- iii. Insert at least one audio and one video
- iv. Hide at least two slides

3. Create a power-point presentation with minimum 5 slides

- i. Use custom animation option to animate the text; the text must move left to right one line at a time.
- ii. Use proper transition for the slides.

PROGRAMS (MS Access)

1. Create a database “Student” with,

- i. At least one table named “mark sheet” with field name “student name, roll number, mark1, mark2, mark3, mark4, total”
- ii. The data types are, student name: text, roll number: number, mark1 to mark4: number, total: number. Roll number must be the primary key.
- iii. Enter data in the table. The total must be calculated using update query.
- iv. Use query for sorting the table according to the descending/ascending order of the total marks.

2. With addition to the table above,

- i. Add an additional field “result” to the “mark sheet” table.
- ii. Enter data for at least 10 students
- iii. Calculate the result for all the students using update queries, if total \geq 200, then pass, else fail.
- iv. Search the students, whose name starts with “sh”.
- v. Show the names and total marks of the students who have passed the examination.

SUGGESTED READINGS

1. Vikas Gupta, “Comdex 14-1in-1 Computer course Kit”, Dream Tech
2. Bittu Kumar, “Master in Ms-Office”
3. Fundamentals of computers - V. Rajaraman - Prentice- Hall of india
4. Microsoft Office 2007 Bible - John Walkenbach, Herb Tyson, Faithe Wempen, Cary N. Prague, Michael R. Groh, Peter G. Aitken, and Lisa A. Bucki -Wiley India pvt. ltd.
5. Introduction to Information Technology - Alexis Leon, Mathews Leon, and Leena Leon, Vijay Nicole Imprints Pvt. Ltd., 2013.

WEBSITES

1. <https://wiki.openoffice.org/wiki/Documentation>
2. <https://bosslinux.in/sites/default/files/BOSS4.0-Usermanual.pdf>
3. <http://windows.microsoft.com/en-in/windows/windows-basics-all-topics>
4. <http://office.microsoft.com/en-us/training/CR010047968.aspx>
5. <http://spoken-tutorial.org>

BACHELOR OF COMPUTER APPLICATIONS

2024-2025

24VAC101

SEMESTER-I

YOGA FOR YOUTH EMPOWERMENT

2H-2C

Instruction Hours/week: L:2 T:0 P:0

இரண்டாம் பருவம்
பகுதி - I, தமிழ், தாள் 2

4H-3C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

பாடத்திட்டப் பொதுநோக்கம்

- கற்றல்வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும்,
- ஆய்வு நோக்கையும் மேம்படுத்துதல்.
- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.
- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும்பங்கினை உணர்த்துதல்.
- வளர்ந்துவரும் சமூகத்தில் அற உணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல். அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்

பாடத்திட்டப் பயன்விளைவு

- இந்தியக் குடியரிமைப்பணி முதலான போட்டித் தேர்வுகளில், விருப்பப்பாடமாக இடம்பெறுகின்ற, 'தமிழ்இலக்கியவரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
- கல்வெட்டியல், ஓலைச் சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வு மனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
- தமிழின் வளர்ச்சித் துறையாகிய, 'அறிவியல்தமிழ்' 'இணையதமிழ்' குறித்த பன்னோக்கு அணுகுமுறையிலான ஆய்வுச் சிந்தனை வளர்ச்சி.
- வேலை வாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத் திறன் மேம்பாடும் பெற்றிருத்தல்.
- சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1											S				
CO2												S			
CO3						M									
CO4		M													
CO5		S													

S-Strong; M-Medium; L-Low

அலகு - I

(08 மணிநேரம்)

நாயன்மார்கள் : தமிழ் இலக்கிய வரிசையில் திருமுறைகளும் நாலாயிரத் திவ்யப்பிரபந்தமும் - பன்னிரு திருமுறைகள் அறிமுகம் - திருமுறை ஆசிரியர்களின் இலக்கியப் பங்களிப்பு **சைவம்-பெரியபுராணம்** -

காரைக்கால் அம்மையார் புராணம் .**முக்கூடற்பள்ளு** - 2 பாடல்கள் - சித்திரக்காலிவாலான் (நெல் வகைகள்) குற்றாலத் திரிகூடமால்வரை (மீன்வகைகள், காளை வகைகள்)

கவிதை : மகாகவி பாரதியார் - யோகசித்தி

கவிதை : கவிமணி தேசிக விநாயகம் பிள்ளை - வாழ்க்கைத்

தத்துவங்கள்

கவிதை : கவிஞர் சுகந்திசுப்பிரமணியம் - புதையுண்டவாழ்க்கை

சிறுகதை : மகாமசானம் - புதுமைப்பித்தன்

இலக்கணம் - வாக்கியஅமைப்பு : தனிவாக்கியம் - தொடர்வாக்கியம் - கலவைவாக்கியம் -தன்வினை வாக்கியம் - பிறவினை வாக்கியம்- செய்வினை, செயப்பாட்டு வினைவாக்கியம், கட்டளைவாக்கியம் - வினாவாக்கியம் - உணர்ச்சி வாக்கியம். நன்னூல் - பொதுவியல் - அறுவகைவினா (385) - எண்வகைவிடை (386).

அலகு- 2

(08 மணிநேரம்)

ஆழ்வார்கள் : இலக்கியப் பங்களிப்பு - திவ்யப் பிரபந்தத்தில் பக்திநெறியும்

இலக்கிய நயமும்

உரைநடை : தோற்றமும் வளர்ச்சியும், **வைணவம் :** பெரியாழ்வார்

திருமொழி: 3-ஆம் பத்து - பத்தாம் திருமொழி 'நெறிந்தகருங்குழல்மடவாய்' -

சீதைக்கு அனுமன் தெரிவித்த அடையாளம். **கவிதை - கவிஞர் வைரமுத்து**

- வித்தியாசமான தாலாட்டு, **சிற்பி பாலசுப்பிரமணியன்**
 - பாரதி எங்கள் கண்மணி, **அரங்க பாரி** -
- கண்ணீர்! கண்ணீர்!

தமிழலங்காரம் – வண்ணச்சரபம் தண்டபாணி சுவாமிகள் - 10 பாடல்கள் 1. கடல் நீரில் கல்மிதக்கும், 2. வண்டமிழ் ஆற்றுதி, 3. கோளத்தை முட்டி 4. எக்காலம்என்று, 5. கடவூர் மயானத்தொர், 6. தேவாதிதேவன், 7. விண்மாரி, 8. தேவர்முனிவர், 9. அமுதேங்கிநஞ்சிட்ட, 10. அத்தனைபொத்து.

சிறுகதை : ஆர். சூடாமணி - அந்நியர்கள்

கட்டுரை : ஆளுமைத்திறன் அறிவோம்- தன்னம்பிக்கை மாதஇதழிலிருந்து

அணிஇலக்கணம் : உவமையணி – பிறிதுமொழிதல் அணி – சிலேடை அணி – தீவக அணி- ஏகதேச உருவக அணி – வேற்றுமையணி – பின்வருநிலையணி

அலகு - 3

(08 மணிநேரம்)

புதுக்கவிதை - தோற்றமும் வளர்ச்சியும்

சிற்றிலக்கியம் - தோற்றமும்வளர்ச்சியும்

மதுரைசொக்கநாதர் - தமிழ்விடுதாது - தமிழின் சிறப்பு பாடியருள பத்துப்பாட்டும் - விளம்பக்கேள்.

கவிதை- ஈரோடுதமிழன்பன் – இன்னொரு சுதந்திரம்

சிறுகதை - கு. அழகிரிசாமி - இருவர் கண்ட ஒரேகனவு

கட்டுரை - ஓளவைதுரைசாமி - ஏட்டில் இல்லாத இலக்கியம்

படைப்பிலக்கியப் பயிற்சிகள் - மரபுக்கவிதை, புதுக்கவிதை, சிறுகதை, கட்டுரை படைப்பாக்க உத்திகள் –பயிற்சிகள்

அலகு - 4

(08 மணிநேரம்)

சிறுகதை - தோற்றமும் வளர்ச்சியும்

கலிங்கத்துப்பரணி – தேவாசரம், உடலின்மேல், நெடுங்குதிரை மிசைக்கலணை, விருந்தினரும் வறியவரும், தரைமகள் தன்கொழுநன்றன், பொருதடக்கை, வாளெங்கே, வெயில்தாரை.

அருள்தரும் பூங்கோதையன்னை அந்தாதி - 11பாடல்கள்

1. பகவன்பெயரை, 2.மெல்லியல்மேலை,3.வாலின் குரங்கு, 4.தவளே இவள்,
5.சுரக்கும் திருவருட், 6.வதிவாய் விளைபயில்,7.உறைவான், 8.பச்சைப்பேர்,
9.வித்தகம், 10.துணையாய், 11.கலந்தார்.

கவிதை - கவிஞர்தாமரை - தொலைந்துபோனேன்

சிறுகதை - அம்பை - ஜ - வல்லூறுகள்

கட்டுரை- முனைவர் ப. தமிழரசி - நொய்யல்,

சொல்லின் செல்வர் ரா.பி.சேதுப்பிள்ளை - காளத்திவேடனும்

கங்கைவேடனும் மொழிபெயர்ப்புப் பயிற்சிகள் : தமிழ்-ஆங்கில

மொழிபெயர்ப்புப் பயிற்சிகள் -2.

அலகு - 5

(08 மணிநேரம்)

நாட்டுப்புற இலக்கியங்கள் - அறிமுகம்

கவிதை - புரட்சிக்கவிஞர் பாரதிதாசன் - தமிழின் இனிமை

கவிதை - கவிஞர் அறிவுமதி - நட்புக்காலம்

சிறுகதை - நாஞ்சில்நாடன் - இந்நாட்டு மன்னர்

கீழடி - வைகை நதிக்கரையில் சங்ககால

நகரநாகரிகம்

மொழிபெயர்ப்புப் பயிற்சிகள் : ஆங்கிலம் - தமிழ் மொழிபெயர்ப்புப்

பயிற்சிகள்-2

SEMESTER-II
PART II ENGLISH II

3H-3C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To refresh the grammar knowledge of the students to improvise their language.
- To make the students to speak and write errors free English.
- To make the students understand different kinds of communication.
- To help the students develop their listening, speaking, reading and writing skills.
- To Introduce literary works to the students to enhance their analytical and aesthetic skills.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Strengthen the foundation of the language to elevate the command of standard grammar.	Remember
CO2	Formulate and communicate persuasive arguments for specific business outcome.	Apply
CO3	Utilize fundamentals of language for reading, writing and effective communication.	Apply
CO4	Standardize and demonstrate understanding of LSRW skills.	Understand
CO5	Introduce literature to enhance the moral and aesthetic values.	Evaluate

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1		S													
CO2		S												S	
CO3		S													
CO4		S												M	
CO5												M	S		

S-Strong; M-Medium; L-Low

UNIT-I		6 HOURS
Listening	: Listening for Pleasure (Poetry)	
Speaking	: Developing speaking skills	
Reading	: Reading strategies	
Writing	: Developing a story with pictures	
Literature	: Refuge Mother and Child by Chinua Achebe	
Grammar	: Voice	
UNIT- II		6 HOURS
Listening	: Listening for Pleasure (Story)	
Speaking	: Oral presentation	
Reading	: Reading Passages	
Writing	: Essay writing	
Literature	: Prose: Dimensions of Creativity by A.P.J. Abdul Kalam	
Grammar	: Subject, verb, agreement	
UNIT-III		6 HOURS
Listening	: Dictation	
Speaking	: Public speaking and secrets of good delivery	
Reading	: Note Making	
Writing	: Writing agendas, memos and minutes	
Literature	: River by A.K. Ramanujan	
Grammar	: Degrees of comparison	
UNIT- IV		6 HOURS
Listening	: Listening to instructions and announcements	
Speaking	: Debating	
Reading	: Silent reading and methods of reading	
Writing	: Writing Notices	
Literature	: Two Gentlemen of Verona by A.J. Cronin	
Grammar	: Phrases and clauses	
UNIT-V		6 HOURS
Listening	: Testing listening	
Speaking	: Situational Conversation	
Reading	: Developing reading activities	
Writing	: E - Mail Writing	
Literature	: The Postmaster by Rabindranath Tagore	
Grammar	: Direct and indirect speech	

SUGGESTED READINGS

1. Oxford Handbook of Writing: St. Martins Handbook of Writing 2013 Cambridge University Press
2. Sound Business, Julian Treasure 2012Oxford University Press
3. Hornby, A,S.(1975) The Guide to patterns and usage in English: oxford university Press.

SEMESTER-II
OBJECT ORIENTED PROGRAMMING

5H-4C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- Enable to differentiate procedure oriented and object-oriented concepts.
- Learn the importance of data hiding in object-oriented programming
- Impart knowledge of object-oriented programming concepts and implement them using C++
- Understand the concepts of inheritance, its types and overloading
- Develop simple applications

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

COs	Course Outcomes	Blooms Level
CO1	Apply the concepts of object-oriented programming & Java	Understand
CO2	Implement the basic programming concepts in C++	Apply
CO3	Handle multiple threads and build exception-free codes	Understand
CO4	Identify the concepts of inheritance and its types and develop applications using overloading features.	Analysis
CO5	Create simple applications with inheritance, interface and package	Create

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S		S	M					L						
CO2	S		S	M					L						
CO3	S		M	M	S				L						
CO4	S		M	M	S				L						
CO5	S		S	M	S	L			L						

S-Strong; M-Medium; L-Low

UNIT I

10 HOURS

INTRODUCTION TO OBJECT ORIENTED PROGRAMMING: Object Oriented Programming : Object Oriented Paradigm – Structured Programming Versus Object Oriented Development – Basic Concepts - I/O in C++ - C++ Declarations. Control Structures : - Decision Making and Statements : If ..else, jump, goto, break, continue, Switch case statements - Loops in C++ : for, while, do - functions in C++ - inline functions – Function Overloading.

UNIT II

10 HOURS

CLASSES AND OBJECTS: Specifying a class – Creating Objects – Accessing Class Members – Defining Member Functions – Static Data Members – Static Member Functions - Array of Objects – Friend Functions. Constructors and Destructors: - Constructors – Parameterized Constructors - Multiple Constructors in a Class – Constructors with Default Arguments - Copy Constructor - Dynamic Constructor – Destructors.

UNIT III

10 HOURS

TEMPLATES AND FILES: Template Functions and Template Classes - Streams: Stream Classes – Formatted and Unformatted Data – Manipulators – User Defined Manipulators – File Streams – File Pointer Manipulation – Sequential File Access- Random File Access- Standard Template Library : Overview- Container Class - Vectors- Lists- Maps- Algorithms – String Class.

UNIT IV

10 HOURS

JAVA BASICS: Overview of Java - Program Structure - Class - Objects - Methods – Inheritance – Package – Interface – Exception handling – String Handling – Multithreading - Threads - Synchronization – Deadlocks.

UNIT V

10 HOURS

PACKAGES AND AWT: Packages : I/O Packages - Collections : Set - Sorted Set - List - Map - Sorted Map - Enumeration - Vector - Stack - Dictionary - Hash table- Applet – Applications – AWT – Working with Windows, Graphics, Text – Using AWT controls – Layout managers – Menus – Dialog Box – Introduction to Swing.

SUGGESTED READINGS

1. OBJECT ORIENTED PROGRAMMING : OBJECT ORIENTED PROGRAMMING - I, Dr Manmohan Singh, Rahul Sharma ,Ankit Chakrawarti, March 2022, Notion Press.
2. Joel Murach, Mary Delamater, 2018. C++ Programming, Mike Murach & Associates Inc.
3. Object Oriented Programming Methodology, Harish G. Narula, 2016, Ihsaan Muhiyadheen.
4. Advanced Java Black Book, Dr. R. Nageswara Rao, 2008, Dreamtech Press.

WEBSITES

1. www.programmingsimplified.com
2. [www.programiz.com / cpp -programming](http://www.programiz.com/cpp-programming)
3. www.cplusplus.com

SEMESTER-II
DISCRETE STRUCTURES

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 (CO)

- To know the basic concepts of logical connectives.
- To learn the basic concepts of sets, functions and relations.
- To understand about pigeonhole principle, permutation and combination, mathematical induction.
- To solve linear difference equation problems using recurrence relations and generating functions.
- To achieve command of the fundamental definitions and concepts of graph theory.

Course Outcomes

On successful completion of the course, students will be able to

COs	Course Outcomes	Blooms Level
CO1	Ability to apply mathematical logic to solve problems.	Understanding
CO2	Familiar with elementary algebraic set theory.	Understanding
CO3	Acquire a fundamental understanding of the permutation and combination.	Applying
CO4	Describe the method of recurrence relations.	Applying
CO5	Get wide knowledge about graphs and trees.	Analyze

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	S	S	L	M	-	-	-	-	-	-	L	-	M	-
CO2	S	S	L	M	-	-	-	-	-	-	L	-	M	-
CO3	S	S	L	M	-	-	-	-	-	-	L	-	M	-
CO4	S	S	L	M	-	-	-	-	-	-	L	-	M	-
CO5	S	S	L	M	-	-	-	-	-	-	L	-	M	-

S-Strong; M-Medium; L-Low

UNIT I : **8 HOURS**

Propositional Logic: Propositions - Truth tables - Logical connectives - Well-formed Formulas - Demorgan's Law - Tautologies and contradictions - PDNF and PCNF – Equivalences - Inference theory - Rules of universal specification and generalization.

UNIT II : **8 HOURS**

Sets: Introduction – Basic concepts of set theory – Operations on sets – Venn diagram - Relations - Properties of binary relations - Types of relation – Functions - Types of functions - Composition of functions - Inverse functions..

UNIT III : **8 HOURS**

Combinatorics: Pigeonhole principle - Permutation and Combination - Principle of inclusion and exclusion - Mathematical induction

UNIT IV: **8 HOURS**

Recurrences: Recurrence Relations - Solving linear recurrence relation with constant coefficient - Characteristic root method - Generating Functions.

UNIT V: **8 HOURS**

Graph Theory: Introduction - Basic definitions and terminology - Graph isomorphism – Paths and connectivity - Euler and Hamiltonian paths and circuits. Trees - Basic terminology and properties of trees. (Excluding theorems)

SUGGESTED READINGS

1. Sharma J. K., (2011). Discrete Mathematics (Third Edition), Rajiv Beri for Macmillan Publishers India Ltd. New Delhi.
2. Tremblay, J. P., and Manohar R., (2008). Discrete Mathematical Structures with Applications to Computer Science (1st ed.), McGraw-Hill Book Company, New Delhi.
3. Kenneth Rosen., (2019). Discrete Mathematics and Its Applications (8th ed.), McGraw Hill Company, New Delhi.
4. Dr. Singaravelu A., and Dr. Jeyaraman M.P., (2019). Discrete Mathematics, Meenakshi Agency Chennai.
5. Hunter, D.J. (2016). Essentials of Discrete Mathematics (3rd ed.). Jones and Bartlett Publishers, New Delhi.
6. Hein, J.L., (2010). Discrete Structures, Logic, and Computability (3rd ed.), Jones and Bartlett Publishers, New Delhi.

WEBSITES

1. <https://www.youtube.com/watch?v=xIUfKMKSB3Y&list=PL0862D1A947252D20>

SEMESTER-II

DATA STRUCTURES AND ALGORITHM DESIGN

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

The objectives of this course is to make the learns to

- Understand the fundamental concepts of data structures.
- Demonstrate stacks, queues and linked lists.
- Learn tree data structures, and terminologies.
- Understand the fundamental concepts and terminology related to graphs.
- Classify sorting, searching and hashing algorithms.

Course Outcomes

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

Cos	Course Outcomes	Blooms Level
CO1	Understand and Define Algorithms and Data Structures.	Understand
CO2	Understand about Queues and linked lists.	Understand
CO3	Understand Tree Data Structures and various applications.	Understand
CO4	Analyse Graph Concepts and Terminology.	Analyze
CO5	Analyse various sorting algorithms and Hashing Techniques.	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S														
CO2	S														
CO3	S		M	S					M						
CO4	S				M										
CO5	S		M						M						

S-Strong; M-Medium; L-Low

UNIT I**8 HOURS**

Introduction-Mathematical Background-Process of Analysis-Calculation of Storage Complexity- Calculation of Time Complexity-Abstract Data Types – List – array-based implementation – linked list implementation — singly linked lists- circularly linked lists- doubly-linked lists – applications of lists.

UNIT II**8 HOURS**

Stack Introduction – Operations – Applications – Evaluating arithmetic expressions- Conversion of Infix to postfix expression – Queue Introduction – Operations – Circular Queue – Priority Queue – deQueue – applications of queues.

UNIT III**8 HOURS**

Tree – Introduction-Tree traversals – Binary Tree ADT – expression trees – applications of trees – binary search tree ADT –Threaded Binary Trees- AVL Trees – B-Tree – B+ Tree – Heap – Applications of heap.

UNIT IV**8 HOURS**

Graphs Definition – Representation of Graph – Types of graph – Breadth-first traversal – Depth-first traversal – Topological Sort – Bi-connectivity – Cut vertex – Euler circuits – Applications of graphs.

UNIT V**8 HOURS**

Searching- Linear Search – Binary Search. Sorting – Bubble sort – Selection sort – Insertion sort – Shell sort – Radix sort-Heap Sort-Quick Sort. Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

SUGGESTED READINGS

1. R. S. Salaria (Author)-Data Structures and Algorithms using C, Khanna Publishing, Fifth Edition - 2018
2. Reema Thareja, —Data Structures Using C, Third Edition, Oxford University Press, 2014
3. Mark Allen Weiss. (2012). Data Structures and Algorithms Analysis in Java (3rd ed.). Pearson Education.
4. Goodrich, M., & Tamassia, R. (2014). Data Structures and Algorithms in Java (6th ed.). Wiley.
5. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, —Introduction to Algorithms”, Fourth Edition, Mcgraw Hill, 2022.
6. Sartaj Sahni. (2011). Data Structures, Algorithms and applications in C++ (2nd ed.). Universities Press.

WEBSITES

1. http://en.wikipedia.org/wiki/Data_structure
2. <http://www.cs.sunysb.edu/~skiena/214/lectures/>
3. www.amazon.com/Teach-Yourself-Structures-Algorithms

SEMESTER-II
OBJECT ORIENTED PROGRAMMING - PRACTICAL

4H-2C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To understand how C++ improves C with object-oriented feature.
- To learn how to perform operator overloading and inheritance.
- To learn how to design C++ using pointers.
- To learn file handling in C++.
- To learn the characteristics of an object-oriented programming language: data abstraction and information hiding, inheritance, and dynamic binding of the messages to the methods.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Handle different event in java using the delegation event model, event listener and class	Understand
CO2	Solve the real time problems using classes and objects	Apply
CO3	Experiment with multithreading, exception handling mechanism and collections.	Understand
CO4	Demonstrate constructors and method overloading using classes and objects.	Apply
CO5	Make use of exception handling mechanisms and multithreaded model to solve real world problems	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S		S	S					L						
CO2	S		S	S											
CO3	S		M	S					L						
CO4	S		M	S											
CO5	S		M	S					L						

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS

40 HOURS

1. Write a program to print sum of digits using constructor and destructor
2. Write a program to check palindrome number using class and objects
3. Write a program to swap numbers using friend function.
4. Write a program to perform multiplication of two matrices using operator overloading.
5. Write a program that will read 10 integers from user and store them in an array using pointers.
6. Write a program to demonstrate the student mark list using inner class and outer class
7. Write a program to demonstrate the employee payroll using inheritance
8. Write a program to demonstrate the try, catch block
9. Write a program to count the number of lines, words and characters in a given text.
10. Write a program that uses a single file for both reading and writing the data.

SUGGESTED READINGS

1. Antonio Mallia, Francesco Zoffoli, 2019, C++ Fundamentals, Packt Publishing, Ltd.
2. Bjarne Stroustrup, 2014, Programming - Principles and Practice using C++, 2nd Edition, Addison-Wesley.
3. Herbert Schildt., "Java: The Complete Reference", 11th Edition, McGraw Hill Education, New Delhi, 2019.
4. Jamie Jaworski, "Java Unleashed", SAMS Tech media Publications, 1999.

WEBSITES

1. www.programmingsimplified.com
2. www.programiz.com/cpp-programming
3. www.cplusplus.com
4. www.learncpp.com
5. www.udemy.com

SEMESTER-II
WEB PROGRAMMING - PRACTICAL

4H-2C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To introduce the fundamentals of Internet and the Web functions.
- To impart knowledge and essential skills necessary to use the internet and its various components.
- To find, evaluate, and use online information resources.
- To use Google Apps for education effectively
- To introduce the fundamentals of HTML functions.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Understand the fundamentals of Internet and the Web concepts	Understand
CO2	Understand the various component of web concepts	Understand
CO3	Explain the usage of internet concepts and analyze its components.	Analysis
CO4	Identify and apply the online information resources	Apply
CO5	Inspect and utilize the appropriate Google Apps for education effectively	Analysis

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S									S					
CO2	S									S					
CO3	S								L	S					
CO4	S									S					
CO5	S							S	L	S					

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS

40 HOURS

USING HTML

1. Design a web page using text formatting, List, Image, table and anchor tags.
2. Create a website of your department with minimum five links using HTML.
3. Design a form to read student details using form elements.
4. To create a web page using Frames in HTML.
5. Create a document using Form to support Local Processing of Order form.
6. Create a web page with the following. i) Cascading style sheets. ii) Use your college information for the web pages Using Frames

USING JAVASCRIPT

7. To write JavaScript program to compute squares and cubes of numbers from 5 to 15.
8. To write JavaScript program to find the largest of three numbers.
9. To write JavaScript program to find the factorial of a number.
10. To write JavaScript program to calculate sum and average of numbers.
11. To write JavaScript program to count the number of negative numbers, positive numbers and zeros in the list.
12. To write JavaScript program to prompt username and display it.

SUGGESTED READINGS

1. Principles of web design. Joel sklar, sixth edition,2015
2. “Web Coding & Development All-in-One For Dummies”, Paul McFedries ,2018
“Fundamentals of Web Development” ,Randy Connolly, Ricardo Hoar ,2017
3. Thomas A Powell, Fritz Schneider, “JavaScript: The Complete Reference”, Third Edition, Tata McGraw Hill, 2013
4. “HTML and CSS: Design and Build Websites”, Jon Duckett,2014

WEBSITES

1. <https://developer.mozilla.org/enUS/docs/Web/JavaScript/Guide>.
2. <http://www.freeCodeCamp Guides.com/>
3. <http://www.Codrops CSS Reference/>

BACHELOR OF COMPUTER APPLICATIONS
24VAC201

2024-2025

SEMESTER-II
ENVIRONMENTAL STUDIES

2H-2C

Instruction Hours/week: L:2 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

NPTEL/SWAYAM COURSE

மூன்றாம் பருவம்

பகுதி - I, தமிழ் இலக்கிய வரலாறு- தாள் 3

4H-3C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

பாடத்திட்டப் பொதுநோக்கம்

பாடத்திட்டப் பயன்விளைவு

1. வரலாற்றிற்கு முற்பட்ட தமிழகத்தை மாணவர்களுக்கு அறிமுகப்படுத்துதல்
2. பழந்தமிழர் பண்பாடு சார்ந்த வாழ்க்கை முறையை மாணவர்கள் அறிய ஊக்குவித்தல்
3. தமிழ்மொழியின் பழைமையும், திராவிட மொழிகளில் தமிழ்மொழியின் தனிச்சிறப்பையும் மாணவர்களுக்கு அறிமுகப்படுத்துதல்.
4. தமிழர்களின் வாழ்வியல், தமிழர் கலைகள், ஆற்றங்கரைப் பண்பாடுகள் குறித்து மாணவர்கள் அறியச் செய்தல்.
5. இந்தியக் குடியரிமைப் பணி முதலான போட்டித் தேர்வுகளில் விருப்பப் பாடமாக இடம்பெறுகின்ற தமிழ் நாகரிகமும் பண்பாடும் குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1											S				
CO2												S			
CO3						M									
CO4		M													
CO5		S													

S-Strong; M-Medium; L-Low

அலகு:1 சங்க இலக்கியம்**(10 மணிநேரம்)**

தமிழ் இலக்கிய வரிசை-அறிமுகம்-முச்சங்க வரலாறு-பாட்டும் தொகையுமாகிய சங்க இலக்கியத் தொகுப்பு-அறிமுகம்-எட்டுத்தொகையில் அகத்திணை-புறத்திணை-பத்துப்பாட்டில் அமைந்த ஆற்றுப்படை இலக்கியங்கள்-பத்துப்பாட்டில் அகமும் புறமும்-புலவர்களும் பாடல்களும்-பெண்பாற் புலவர்கள்.

அலகு: 2 அற இலக்கியமும் காப்பியமும்**(10 மணிநேரம்)**

திருக்குறள்-அமைப்பு-இலக்கியச் சிறப்பு-உலகப் பொதுமைத் தன்மை-பொருட் சிறப்பு-இலக்கியச் சிறப்பு-நாலடியார் முதலாக குமரகுருபரரின் நீதிநெறிவிளக்கம் ஈறாக அமைந்த நீதி இலக்கியங்கள்-நீதி நூல்களில் அகமும் புறமும்-தமிழ் இலக்கிய வரிசையில் ஐம்பெருங் காப்பியங்களும், ஐஞ்சிறு காப்பியங்களும்- சிலம்பும் மணிமேகலையும் - இரட்டைக்காப்பியங்கள்-கம்பராமாயணம்-பெரியபுராணம்-சீறாப்புராணம்-தேம்பாவணி-இராவண காவியம்.

அலகு:3 திருமுறைகளும் திவ்யப்பிரபந்தமும்**(10 மணிநேரம்)**

தமிழகத்தில் பக்தி இயக்கத்தின் தோற்றமும் வளர்ச்சியும்-பன்னிரு திருமுறைகளும், பதிநான்கு சித்தாந்த சாத்திரங்களும்-திவ்யப்பிரபந்தமும், இராமானுஜ நூற்றந்தாதி முதலான வைணவ இலக்கியங்களும்

அலகு: 4 சிற்றிலக்கியங்களும் இக்கால இலக்கியங்களும்**(10 மணிநேரம்)**

குற்றாலக்குறவஞ்சி, முக்கூடற்பள்ளு, மதுரை மீனாட்சியம்மை பிள்ளைத்தமிழ், மதுரை சொக்கநாதர் தமிழ்விடு தூது, அழகர் கிள்ளைவிடு தூது முதலான சிற்றிலக்கிய வரிசை-தமிழில் புதுக்கவிதை இயக்கங்களின் தோற்றமும் வளர்ச்சியும்-தமிழ்ப் புதுக்கவிதை வடிவங்கள்-தமிழின் நாடக இலக்கியங்கள்-மனோண்மணீயம் - தமிழின் உரைநடை இலக்கிய வளர்ச்சி-தமிழின்பம் முதலான உரைநடை நூல்கள்-தமிழில் சிறுகதை இலக்கிய வளர்ச்சி-இருபதாம் நூற்றாண்டுச் சிறுகதைகள்-தமிழில் புதின இலக்கியங்கள்-இக்கால இலக்கியங்களில் காலந்தோறும் தனி மனிதப் பதிவுகளும், சமுதாயப் பதிவுகளும்.

அலகு: 5 தமிழின் ஐந்திலக்கணம்**(08 மணிநேரம்)**

தமிழின் எழுத்து-சொல்-பொருள்-யாப்பு-அணி என்றமைந்த தமிழின் ஐந்திலக்கணக்கொள்கைகள்-நன்னூல்-தொல்காப்பியம் யாப்பருங்கலக்காரிகை - புறப்பொருள் வெண்பாமாலை -நம்பி அகப்பொருள் முதலான இலக்கண நூல் சிந்தனைகள்.

பாடநூல்:

1. தமிழ் இலக்கிய வரலாறு - மொழிகள் துறை - தமிழ்ப்பிரிவு, கற்பகம் உயர்கல்விக்கழகம், கோயம்புத்தூர் -21.

பார்வை நூல்கள்:

1. தமிழ் இலக்கிய வரலாறு – தமிழண்ணல், மீனாட்சி புத்தக நிலையம்- மதுரை.
2. தமிழ் இலக்கிய வரலாறு – வேங்கடராமன்.கா.கோ. கலையகம் பதிப்பகம், நாமக்கல்.
3. புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு-சுந்தரமூர்த்தி.செ, அவ்வை பதிப்பகம், திருவாரூர்.
4. தற்காலத் தமிழ் இலக்கிய வரலாறு - கவிஞர் திலகம் மானூர் புகழேந்தி, நிலாப் பதிப்பகம், 63,பாரதிதாசன் நகர், இராமநாதபுரம், கோவை – 641045.

SEMESTER-III
PART II ENGLISH III

3H-3C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To enable students, learn correct pronunciation, spelling, meaning and usage of English Vocabularies.
- To give English language skill practice to students to enhance their English proficiency.
- To expose students to native speakers’ spoken language to enable students to recognize native speakers’ accent and language usage.
- To help students to become autonomous and self-directed English language learners.
- To produce entrepreneurs among students by making them English language trainers and take communicative English to schools and colleges around.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Demonstrate the skill to write in English without grammatical error.	Apply
CO2	Practice listening effectively to communication in English.	Apply
CO3	Develop the ability to speak English language with the right way of pronunciation.	Understand
CO4	Express the viewpoints with confidence in English.	Analyze
CO5	Express values and skills gained through effective communication to other disciplines.	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1		S							L						
CO2		S												S	
CO3		S							L						
CO4		S									M			M	
CO5		S										M	S		

S-Strong; M-Medium; L-Low

UNIT-I **8 HOURS**

Listening: Listening Comprehension-Listening for Specific Information- Interpreting Charts and Diagrams

UNIT- II **7 HOURS**

Speaking: Essentials of effective Communication- Telephone Skills: Understanding Telephone Conversation-Handling Calls-Leaving Messages-Making Requests-Giving Instructions and Orders.

UNIT-III **7 HOURS**

Reading: Reading with a purpose-Skimming and Scanning-Locating Main Points-Reading Critically- Sequencing of Sentences-Reading Comprehension

UNIT- IV **7 HOURS**

Writing: Descriptive and Narrative-Safety Instructions- Suggestions-Expansion of abbreviations-Spellings Rules Translation- Translating Short Sentences and Passages from English to Tamil

UNIT-V **7 HOURS**

Vocabulary: Synonyms-Antonyms-Prefixes-Suffixes- Idioms- Different Types of English-Homonyms and Homophones (British and American)

SUGGESTED READINGS

1. Oxford Handbook of Writing: St. Martins Handbook of Writing 2013 Cambridge University Press
2. Wren & Martin, 2008, *High School English Grammar & Composition*, S.Chand & Company Ltd, Board of Editors,
3. Krashen, Stephen D (1982) Principles and practice in second language acquisition. New York: Pergamon Press.

SEMESTER-III
OPERATING SYSTEM

5H-4C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To understand basic concepts of Operating System, its functions and services.
- To familiarize the management functions of Operating System.
- To acquire knowledge about basic concepts of mass storage structure
- To acquire knowledge in File System Interface.
- To enrich the knowledge about protection and security

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Ability to understand about basic concepts of Operating System, its functions and services.	Understand
CO2	Understanding about Process Management, CPU scheduling, File handling and I/O operations.	Apply
CO3	Ability to understand about memory management	Analyze
CO4	Understanding about of mass storage structure and file system implementation	Apply
CO5	Acquiring basic knowledge about Protection, Threats and Security	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S			M											
CO2	S			M	L										
CO3	S			L											
CO4	S								L						
CO5	S				S				L						

S-Strong; M-Medium; L-Low

UNIT -I**12 HOURS**

Introduction to Operating System: Introduction, Objectives and Functions of OS, Evolution of OS, OS Structures, OS Components, OS Services, System calls, System programs, Virtual Machines.

UNIT – II**12 HOURS**

Process Management: Processes: Process concept, Process scheduling, Co-operating processes, Operations on processes, Inter process communication, Communication in client- server systems. **Threads:** Introduction to Threads, Single and Multi-threaded processes and its benefits, User and Kernel threads, Multithreading models, Threading issues.

CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling Algorithms, Multiple Processor Scheduling, Real-time Scheduling, Algorithm Evaluation, Process Scheduling Models.

Process Synchronization: Mutual Exclusion, Critical – section problem, Synchronization hardware, Semaphores, Classic problems of synchronization, Critical Regions, Monitors, OS Synchronization, Atomic Transactions

Deadlocks: System Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock

UNIT – III**12 HOURS**

Memory Management: Logical and physical Address Space, Swapping, Contiguous Memory Allocation, Paging, Segmentation with Paging.

Virtual Management: Demand paging, Process creation, Page Replacement Algorithms, Allocation of Frames, Thrashing, Operating System Examples, Page size and other considerations, Demand segmentation.

UNIT – IV**12 HOURS**

Storage Management: File-System Interface: File concept, Access Methods, Directory structure, File- system Mounting, File sharing, Protection and consistency semantics

File-System Implementation: File-System structure, File-System Implementations, Directory Implementation, Allocation Methods, Free-space Management, Efficiency and Performance, Recovery

Disk Management: Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Attachment, stable-storage Implementation

UNIT -V**12 HOURS**

Protection and Security: Protection: Goals of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Revocation of Access Rights, Capability- Based Systems, Language – Based Protection Security: Security Problem, User Authentication, One – Time Password, Program Threats, System Threats, Cryptography, Computer – Security Classifications.

SUGGESTED READINGS

1. Tanenbaum, Operation System Concepts, 2nd Edition, Pearson Education.
2. Silberschatz / Galvin / Gagne, Operating System,6th Edition,WSE (WILEY Publication)
3. Andrew S. Tanenbaum, “Modern Operating Systems”, Prentice Hall
4. Garry Nutt, “Operating Systems – A Modern perspective ”, Third Edition, Pearson Education
5. Bach, M.J., “Design of UNIX Operating System”, Prentice Hall
6. Charles Crowley, “Operating systems – A Design Oriented Approach”, Tata McGrawhill, 1997
7. Michel Palmer “Guide o Operating Systems”, Vikas Thomson Learning Publishing, NewDelhi
8. Milan Milonkovic, Operating System Concepts and design, II Edition, McGraw Hill 1992.
9. William Stallings, Operating System, 4th Edition, Pearson Education.
10. H.M.Deitel, Operating systems, 2nd Edition ,Pearson Education
11. Nutt: Operating Systems, 3/e Pearson Education 2004
12. D.M.Dhamdhere, “Operating Systems”, 2nd Edition, Tata McGraw-Hill

SEMESTER-III
COMPUTER NETWORKS

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 know the basics of computer networks
- To acquire the knowledge about the data link layer in the internet
- To understand the process of protocols, router, cellular networks
- To analyze the network layer with different techniques using routing algorithm
- To analyze the concepts of application layer and network security

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Understand the fundamentals concepts of computer network	Understand
CO2	Understand the DLL services and different protocol uses in computer networks	Understand
CO3	Understand the uses of various protocols and Connection devices	Understand
CO4	Analyze the network layer and transport layer services	Analyze
CO5	Analyze the application layer and network security in trouble shooting the network	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S									S					
CO2	S		L							S					
CO3	S		L						L	S					
CO4	S			L						S					
CO5	S			L	M			M	L	S	M				

S-Strong; M-Medium; L-Low

UNIT I: INTRODUCTION TO COMPUTER NETWORK **9 HOURS**

Networking Fundamentals: Basics of Networking, Networking Terms- Host, Workstations, Server, Client, Node, Advantages of Networking, Types of Networks, Network Topologies, Types of Transmission Media- Guided and Unguided, Communication Modes. Data communication protocols and standards, Network models - OSI model-layers and their functions, TCP/IP protocol suite.

UNIT II: DATA LINK LAYER **9 HOURS**

Data link layer: Error Detection and Correction, Framing, flow and error control, Protocols - Noiseless channels (Simplest, Stop and Wait) and Noisy channels (Stop and Wait and Piggy Backing), PPP.

UNIT III: MULTIPLE ACCESS PROTOCOLS **9 HOURS**

Multiple Access Protocols, Random Access – ALOHA, CSMA. Connecting Devices - Repeater, Modem, Hub, Switch, Bridge, Router, Gateway. Wired LANs - IEEE standards, wireless LANs - Bluetooth, Cellular Telephony, Satellite Networks, SONET.

UNIT IV: NETWORK LAYER AND TRANSPORT LAYER **10 HOURS**

Network layer and Transport layer: Logical addressing – IPv4 addressing, IPv4 address Classes, Subnet Mask, Public & Private IP Address and IPV6 addressing, Address mapping- ICMP, IGMP. Connectionless and Connection-Oriented Services: Transport layer services, UDP and TCP. Congestion Control, Quality of Service. Introduction to Routing and Switching concepts.

UNIT V: APPLICATION LAYER **11 HOURS**

Application Layer: DHCP, DNS, HTTP / HTTPS, FTP, TFTP, SFTP, Telnet, Email: SMTP, POP3 / IMAP. Virtual Private Networking, Network security: Common Threats – Firewalls (advantages and disadvantages), Digital Signature, Troubleshooting the network.

SUGGESTED READINGS

1. Data Communications and Networking with TCP/IP protocols suite – Behrouz A.Forouzan, Fourth Edition TMH, 2006.
2. Computer Networks – Andrew S Tanenbaum, 4th Edition, Pearson Education 2003

SEMESTER-III
OPERATION RESEARCH

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 learn the basic concepts and applications of linear programming and to impart knowledge in concepts and tools of Operations Research.
- To develop the skillsets of learners in formulating and solving LPP.
- To make the student capable of formulating the various real-life decision-making problems as Mathematical programming problems.
- To understand and apply operation research techniques to industrial applications,
- Students to learn the fundamental Techniques of Operations Research and to choose a suitable OR technique to solve problem on hand.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Understand the basic concepts and formulate real-world problems as a linear programming model.	Understand
CO2	Solve complex mathematical models and understand the cost minimization and profit maximization of transportation concepts and assignment problems.	Evaluate
CO3	Recognize the importance and value of Operations Research and mathematical modelling in solving practical problems in industry.	Understand
CO4	Analyze the data and comprehend on performance based on scheduling, queueing and inventory.	Analyze
CO5	Reframe and apply mathematical techniques for shortest path in project networks and graphs	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	S	M	M		M	M	S	M		M	S		M	
CO2	S	S	M	M	M	M	S	M		M	S		M	
CO3	S	S	M	S	S	M	S	L	M	M	S		S	M
CO4	M	M			S	S	M	S		M	S	M	L	
CO5	M	M	S	S	S	S	M	S	M	M	S	M	M	M

S-Strong; M-Medium; L-Low

UNIT I

9 HOURS

Linear Programming - Mathematical Model assumption of linear Programming – Graphical method - Principles of Simplex method- Big-M Method- Duality in LPP.

UNIT II

9 HOURS

Transportation Model: Introduction – Mathematical Formulation –Finding Initial Basic Feasible Solutions – Optimum Solution for Non degeneracy and Degeneracy Model - Unbalanced Transportation Problems and Maximization case in Transportation Problem

UNIT III

10 HOURS

The Assignment problem: Mathematical Formulation of the Problem – Hungarian Method – Unbalanced Assignment Problem- Maximization Case in Assignment Problem - Travelling Salesman Problem.

Queuing Theory: Introduction – Characteristics of Queuing System. Problems in (M/M/1): (∞ /FIFO) and (M/M/1):(N/FIFO) models.

UNIT IV

10 HOURS

Inventory Control: Introduction – Costs involved in Inventory – Deterministic EOQ Models – Purchasing Model without and with Shortage, Manufacturing Model without and with Shortage - Price Break

UNIT V

10 HOURS

PERT and CPM

Introduction - Network scheduling by PERT / CPM – Network and basic components – Rules of Network construction – Time calculation in Networks – CPM. PERT – PERT calculations.

SUGGESTED READINGS

1. Kandiswarup, P. K. Gupta and Man Mohan. (2011). Operations Research, 12th Revised edition, S. Chand & Sons Education Publications, New Delhi.
2. Sharma S.D., (2017). Operations Research Theory, Methods & Applications, Kedar Nath Ram Nath Publications, India.
3. Hamdy A. Taha., (2017). Operations Research-An Introduction, tenth edition, published by Dorling Kindersley (India) Pvt. Ltd., licensees of Pearson Education in South Asia.
4. Prem Kumar Gupta and Hira D.S., (2014). Operations Research, S. Chand & Company Ltd, Ram Nagar, New Delhi.
5. Srinivasan G., (2017). Operations Research: Principles and Applications, PHI, New Delhi

WEBSITES

1. <https://youtu.be/vUMGvpsb8dc>
2. <https://youtu.be/ItOuvM2KmD4>

SEMESTER-III

OPERATING SYSTEM - 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 main components of an OS & their functions.
- To study the process management and scheduling.
- To understand various issues in Inter Process Communication (IPC) and the role of OS in IPC.
- To understand the concepts and implementation Memory management policies and virtual memory.
- To understand the working of an OS as a resource manager, file system manager, process manager, memory manager and I/O manager and methods used to implement the different parts of OS
- To study the need for special purpose operating system with the advent of new emerging technologies
- To understand the structure and organization of the file system

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Understand the process management policies and scheduling of processes by CPU	Understand
CO2	Evaluate the requirement for process synchronization and coordination handled by operating system	Evaluate
CO3	Describe and analyze the memory management and its allocation policies.	Analyze
CO4	Identify use and evaluate the storage management policies with respect to different storage management technologies	Evaluate
CO5	Identify the need to create the special purpose operating system.	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S		M	M	L				L						
CO2	S		M	M				L	L						
CO3	S		L	L	L				L						
CO4	S		L	L	L				L						
CO5	S		M	M					L						

LIST OF PROGRAMS

48 HOURS

- Write a program (using fork () and/or exec () commands) where parent and child execute:
 - same program, same code.
 - same program, different code.
 - before terminating, the parent waits for the child to finish its task.
- Write a program to report behaviour of Linux kernel including kernel version, CPU type and model. (CPU information)
- Write a program to report behaviour of Linux kernel including information on configured memory, amount of free and used memory. (memory information)
- Write a program to print file details including owner access permissions, file access time, where file name is given as argument.
- Write a program to copy files using system calls.
- Write program to implement FCFS scheduling algorithm.
- Write program to implement Round Robin scheduling algorithm.
- Write program to implement SJF scheduling algorithm.
- Write program to implement non-preemptive priority based scheduling algorithm.
- Write program to implement preemptive priority based scheduling algorithm.
- Write program to implement SRJF scheduling algorithm.
- Write program to calculate sum of n numbers using thread library.
- Write a program to implement first-fit, best-fit and worst-fit allocation strategies.

SUGGESTED READINGS

- Silberschatz, A ., Galvin, P.B.,&Gagne,G. 2018. Operating Systems Concepts, 10thed. New Delhi: John Wiley Publications.
- Stallings, W 2016. Operating Systems, Internals & Design Principles (7thed.). New Delhi: Prentice Hall of India.
- Jose M Garrido , Richard Schlesinger Kenneth Hoganson 2015. Principles of Modern

Operating Systems,2nd edition, Library of Congress Cataloging-in-Publication Data.

WEB SITES

1. www.cs.columbia.edu/~nieh/teaching/e6118_s00/
2. www.clarkson.edu/~jnm/cs644
3. pages.cs.wisc.edu/~remzi/Classes/736/Fall2002/

SEMESTER-III
COMPUTER NETWORKS- 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 (CO)

- To learn and use network commands.
- To learn socket programming.
- To implement and analyze various network protocols.
- To learn and use simulation tools.
- To use simulation tools to analyze the performance of various network protocols.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Implement various protocols using TCP and UDP.	Apply
CO2	Compare the performance of different transport layer protocols.	Apply
CO3	Use simulation tools to analyze the performance of various network protocols.	Apply
CO4	Analyze various routing algorithms.	Analyze
CO5	Implement error correction codes.	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S		M	M	L				L						
CO2	S		L	L	L				L						
CO3	S		L	L	L				L						
CO4	S		L	L	L				L						
CO5	S		M	L	L				L						

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS

48 HOURS

1. Write a HTTP web client program to download a web page using TCP sockets.
2. Simulation of DNS using UDP sockets.
3. Write a code simulating ARP /RARP protocols.
4. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.
5. Study of TCP/UDP performance using Simulation tool.
6. Simulation of Distance Vector/ Link State Routing algorithm.
7. Performance evaluation of Routing protocols using Simulation tool.
8. Simulation of error correction code (like CRC).
9. Simulate and implements top and wait protocol for noisy channel.
10. Simulate and implement go back n sliding window protocol.

SUGGESTED READINGS

1. Computer Networks, Andrew S. Tanenbaum, 4th edition, PHI.
2. Data Communication and Networks, Achyut Godbole, 2007, TMH.
3. Computer Networks: Protocols, Standards, and Interfaces, Uyles Black, 2nd ed, PHI
4. Sathish Jain, Madhulika Jain, Vineeta Pillai, Kratika 2016. A Level Data Communication & Network Technologies .BPB publication.
5. Tanenbaum, A.S. 2016. Computer Networks (7th ed.). New Delhi: PHI.

WEBSITES

1. http://docwiki.cisco.com/wiki/Introduction_to_WAN_Technologies
2. www.w3schools.com/tcpip/default.asp
3. <http://www.engppt.com/2009/12/networking-fourouzan-ppt-slides.html>
4. <http://citengg.blogspot.com/p/behrouz-forouzancomputer-networks4th.html>
5. http://www.crectirupati.com/sites/default/files/lecture_notes/DCN%20NOTES.pdf

BACHELOR OF COMPUTER APPLICATIONS
24VAC301

2024-2025

SEMESTER-III
INDIAN KNOWLEDGE SYSTEMS

2H-1C

Instruction Hours/week: L:2 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

NPTEL/SWAYAM COURSE

SEMESTER-III
SUMMER INTERNSHIP

நான்காம் பருவம்

பகுதி - I, தமிழர் நாகரிகமும் பண்பாடும் - தாள் 4

4H-3C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

பாடத்திட்டப் பொது நோக்கம்

1. இந்தியக் குடியரிமைப்பணி முதலான போட்டித் தேர்வுகளில், விருப்பப்பாடமாக இடம்பெறுகின்ற, 'தமிழ்இலக்கியவரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
2. கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வு மனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
3. தமிழின் வளர்ச்சித்துறையாகிய, 'அறிவியல்தமிழ்'; 'இணையதமிழ்' குறித்த பன்னோக்கு அணுகுமுறையிலான ஆய்வுச்சிந்தனை மேம்பாடு.
4. வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
5. சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி. மொழிபெயப்புத் துறைசார்ந்த வேலைவாய்ப்புத்திறன் பெற்றிருத்தல்.

பாடத்திட்ட பயன் விளைவு

1. வரலாற்றிற்கு முற்பட்ட தமிழகத்தை மாணவர்களுக்கு அறிமுகப்படுத்துதல்
2. பழந்தமிழர் பண்பாடு சார்ந்த வாழ்க்கை முறையை மாணவர்கள் அறிய ஊக்குவித்தல்
3. தமிழ்மொழியின் பழைமையும், திராவிட மொழிகளில் தமிழ்மொழியின் தனிச்சிறப்பையும் மாணவர்களுக்கு அறிமுகப்படுத்துதல்.
4. தமிழர்களின் வாழ்வியல், தமிழர் கலைகள், ஆற்றங்கரைப் பண்பாடுகள் குறித்து மாணவர்கள் அறியச் செய்தல்.
5. இந்தியக் குடியரிமைப் பணி முதலான போட்டித் தேர்வுகளில் விருப்பப் பாடமாக இடம்பெறுகின்ற தமிழ் நாகரிகமும் பண்பாடும் குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1											S				
CO2												S			
CO3						M									
CO4		M													
CO5		S													

S-Strong; M-Medium; L-Low

அலகு - 1

(08 மணிநேரம்)

வரலாற்றுக்கு முற்பட்ட தமிழகமும் சங்ககால வரலாறும் வரலாறும் நிலஅமைப்பும் - வரலாற்றின் செல்வாக்கு - பல்வேறு காலங்களில் வரலாறு உண்டாக்கிய நாட்டுப் பிரிவுகள் - பழைய கற்காலம் - புதிய கற்காலம் - இரும்புக் காலம்.

அலகு - 2 தமிழின் தொன்மை

(08 மணிநேரம்)

தமிழ் தோன்றிய இடம் - குமரிக்கண்டத் தமிழ் நாடுகள் - தமிழ் என்னும் பெயர் வரலாறு - திராவிட மொழிக்குடும்பம் - தமிழ்மொழிச் சிறப்பு - தமிழுக்குத் தமிழ் நாட்டவர் செய்ய வேண்டியவை - தமிழுக்கு வெளிநாட்டிற் செய்ய வேண்டியவை

அலகு - 3 தமிழர் வாழ்வியல்

(08 மணிநேரம்)

ஐவகை நிலங்கள் - களவு வாழ்க்கை - கற்பு வாழ்க்கை - அரசர் கடமை - கல்வி நிலை - தொழில் நிலை - ஆடவர் நிலை - பெண்டிர் நிலை

அலகு - 4 கட்டடக்கலையும் தமிழர் பண்பாடும்

(08 மணிநேரம்)

கட்டடக்கலை தோற்றுவாய் - முதற்கலை - கட்டடக்கலையின் பழமை - புதிய கற்காலம் - சங்ககாலம் - கோயில்கள் - அரண்மனைகள் - கோட்டைகள் - வீடுகள் - நீர்ப்பாசனக் கட்டடக்கலை - தமிழர் கட்டடக் கலையின் தனிச்சிறப்பு

அலகு - 5 ஆற்றங்கரை நாகரிகம்

(08 மணிநேரம்)

ஆறும் நாகரிகமும் - ஆறுகளின் தோற்றமும் நீளமும் - காவிரிக்கரை நாகரிகம் - இலக்கியச் சிறப்பு - கலைச்சிறப்பு - வைகைக்கரை நாகரிகம் - இலக்கியச் சிறப்பு - கலைச்சிறப்பு , நொய்யல்கரை நாகரிகம்

பார்வை நூல்கள்:

1. முனைவர் அரங்க இராமலிங்கம் (பதிப்பாசிரியர்), தமிழர் நாகரிகமும் தமிழ் மொழிவரலாறும் (தொகுதி -1, 6, 2, 5, 10), வர்த்தமானன் பதிப்பகம், தியாகராயநகர், சென்னை-17.
2. கே.கே.பிள்ளை, தமிழக வரலாறு மக்களும் பண்பாடும், உலகத்தமிழ் ஆராய்ச்சி நிறுவனம் தரமணி, சென்னை-13.
3. நா.வானமாமலை, தமிழர் வரலாறும் பண்பாடும், நியூசெஞ்சுரி புக்ஹவுஸ், சென்னை -98.

SEMESTER-IV
PART II ENGLISH IV

3H-3C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To provide the students with an ability to build and enrich their communication skills.
- To help them think and write imaginatively and critically.
- To improve the communicative ability.
- To strengthen their professional skills.
- To expose the students to various spoken skills.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Make the students proficient communicators in English.	Apply
CO2	Develop learners' ability to understand English in a wide range of contexts.	Understand
CO3	Understand the nuances of listening, speaking and reading English.	Understand
CO4	Prepare the learners to face situations with confidence and to seek employment in the modern globalized world.	Apply
CO5	Build the students' ability to listen and to speak English better.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1		S													
CO2		S					M								
CO3		S					S								
CO4		S										L		M	
CO5		S												L	

S-Strong; M-Medium; L-Low

UNIT-I **6 HOURS**

Concept of Communication- Barriers to Communication- Body Language-Personality Development-Etiquette and Manners-Soft Skills.

UNIT- II **6 HOURS**

Listening Comprehension-Reading Comprehension-Paragraph Writing-Precis Writing-Collocation

UNIT-III **6 HOURS**

Writing-Writing Resume and Covering Letter- Types of Letter Writing-Writing MoU- Dicto Composition--Term Paper-Book Reviews

UNIT- IV **6 HOURS**

Speaking-Interview Skills-Preparing Welcome address and Vote of Thanks-Compering

UNIT-V **6 HOURS**

Punctuation Marks- Figures of Speech

SUGGESTED READINGS

1. Oxford Handbook of Writing: St. Martins Handbook of Writing 2013 Cambridge University Press
2. Wren & Martin, 2008, High School English Grammar & Composition, S.Chand & Company Ltd, Board of Editors,
3. Krashen, Stephen D (1982) Principles and practice in second language acquisition. New York: Pergamon Press.

SEMESTER-IV
PROGRAMMING IN PYTHON

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 provide Basic knowledge of Python
- To learn how to design and program Python applications.
- To learn how to use lists, tuples, and dictionaries in Python programs.
- To Understand file operation and database creations.
- To provide knowledge about python packages and GUI programming.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Provide Basic knowledge of Python	Understand
CO2	learn how to design and program Python applications	Apply
CO3	learn how to use lists, tuples, and dictionaries in Python programs	Understand
CO4	Applying file operations and database creation.	Apply
CO5	Provide knowledge about python packages and GUI programming	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S									M					
CO2	S														
CO3	S														
CO4	S														
CO5	S		S	S					M						

S-Strong; M-Medium; L-Low

UNIT I : INTRODUCTION TO PYTHON **8 HOURS**

Overview of Programming: Structure of a Python Program, Elements of Python. Introduction to Python: Python Interpreter, Using Python as calculator, Python shell, Indentation. Atoms, Identifiers and keywords, Literals, Strings, Operators.

UNIT II: CREATING PYTHON PROGRAMS **8 HOURS**

Creating Python Programs: I/O Statements, Control statements, Defining Functions, default arguments, Errors and Exceptions.

UNIT III : PYTHON COMPLEX DATA TYPES **8 HOURS**

Python Complex data types: Using string data type and string operations, Defining list and list slicing, Use of Tuple data type. String, List and Dictionary, Manipulations Building blocks, string, List manipulation. Dictionary manipulation, Programming using string, list and dictionary in-built functions. Python Functions, Organizing python codes using functions.

UNIT IV : PYTHON FILE OPERATIONS **8 HOURS**

Python File Operations: Reading files, Writing files in python, Understanding read functions, read(), readline(), readlines(). Understanding write functions, write() and writelines() Manipulating file pointer using seek Programming, using file operations. Database Programming: Connecting to a database, operations, Transaction Control, Disconnecting from a database, Exception Handling in Databases.

UNIT V : PYTHON PACKAGES AND OBJECTS AND CLASSES **8 HOURS**

Python packages: Simple programs using the built-in functions of packages matplotlib, numpy, pandas etc. GUI Programming: Tkinter introduction, Tkinter and Python Programming, Tk Widgets, Tkinter examples. Python programming with IDE. Objects and Classes: Define a Class with class – Inheritance – Override a Method – Add a Method – Get Help from Parent with super – In self Defense.

SUGGESTED READINGS

1. Allen Downey, Jeffrey Elkner, Chris Meyers. How to think like a computer scientist learning with Python / 1st Edition, 2012
2. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning, ISBN: 978- 1111822705
3. Wesley J. Chun, “Core Python Applications Programming”, 3rd Edition , Pearson Education, 2016
4. Charles Dierbach, “Introduction to Computer Science using Python”, Wiley, 2015

WEBSITES

1. <http://docs.python.org/3/tutorial/index.html>
2. <http://interactivepython.org/courselib/static/python>
3. <http://www.ibiblio.org/g2swap/byteofpython/read/>

SEMESTER-IV
NETWORK SECURITY

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 familiarize students with various network protection tools such as firewalls, intrusion detection systems, and proxies.
- To introduce secure communication protocols and techniques.
- To provide knowledge of LAN attacks such as ARP cache poisoning and VLAN hopping.
- To introduce about firewalls and web security
- To provide basic knowledge about IP Security

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Understand the principles of network protection and the role of firewalls.	Understand
CO2	Understand the principles and usage of secure communication protocols like SSH, SSL/TLS, and VPN.	Understand
CO3	Understand the concepts of Encrypting and Signing Emails	Understand
CO4	Analyze the Network based malware techniques	Analyze
CO5	Analyse network Security in LAN attacks	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S		S	S					L						
CO2	S		S	S					L						
CO3	S		S	S					L						
CO4	S		S	S	M				L						
CO5	S		S	S	M				L						

S-Strong; M-Medium; L-Low

UNIT I: INTRODUCTION TO NETWORK SECURITY **8 HOURS**

Techniques for Network Protection, Monitoring and Detection: Firewalls, packet filter and stateful firewalls, application aware firewalls, personal firewalls – IP tables, Proxies, NAT, Intrusion Detection System-Snort, Signature and Anomaly based detection, Honeypots and Honeynets. Network Log management-syslog or SPLUNK;

UNIT II: SECURE NETWORK COMMUNICATION **8 HOURS**

Secure Network Communication: SCP, SSH, SSL3.0, TLS1.2, START TLS, IPsec, VPN and Secure HTTP; Attacks on SSL / TLS: SSL stripping, Drown and Poodle attack;

UNIT III: ENCRYPTING AND SIGNING EMAILS **8 HOURS**

Encrypting and Signing Emails: PGP – GPG / open PGP, DKIM and SPF; Network packet creation and Manipulation using scapy and dpkt libraries; SDN Security

UNIT IV: ATTACK TECHNIQUES **8 HOURS**

Attack Techniques: Network reconnaissance – Nmap and vulnerability audits – open VAS; DNS based attacks, Phishing – DNS Twist ; Network based malware attacks: Remote access Trojan – Poison Ivy and Domain name generation algorithm – based Botnets

UNIT V: LAN ATTACKS **8 HOURS**

LAN attacks: ARP Cache poisoning- Ettercap / arpspoof, MAC flooding, Port Stealing, DHCP attacks, VLAN hopping; Network Sniffing – Wire shark and Password Cracking-John the Ripper

SUGGESTED READINGS

1. William Stallings, Cryptography and Network Security: Principles and Practice, 8th Edition, Pearson edition, 2020.
2. Behrouz A.Forouzan, Cryptography & Network Security, McGraw-Hill, 3rd Edition 2015.
3. W.Stallings, Network Security Essentials: Applications and Standards, 6th Edition, Pearson Prentice Hall, 2016.
4. C.Kaufman,R.PerlmanandM.Speciner,NetworkSecurity:PrivateCommunicationinaPublic World, 2nd Edition, Prentice Hall PTR, 2002.
5. VincentJ.Nestleret.al,PrinciplesofcomputersecurityLabManual,4thEdition,McGraw-Hill, 2014.

WEBSITES

1. <https://dl.hiva-network.com/Library/security/Cryptography-and-network-security-principles-and-practice.pdf>
2. <https://daxinimehul321.wordpress.com/wp-content/uploads/2014/11/cryptography-and-network-security-forouzan-copy.pdf>
3. [https://aitskadapa.ac.in/ebooks/CSE/COMPUTER%20NETWORKS/Principles%20of%20Computer%20Security%20CompTIA%20Security+%20and%20Beyond%20Lab%20Manual,%202ndEdition%20\(%20PDFDrive%20\).pdf](https://aitskadapa.ac.in/ebooks/CSE/COMPUTER%20NETWORKS/Principles%20of%20Computer%20Security%20CompTIA%20Security+%20and%20Beyond%20Lab%20Manual,%202ndEdition%20(%20PDFDrive%20).pdf)

SEMESTER-IV
RELATIONAL DATABASE MANAGEMENT SYSTEM

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 describe a good introduction to the discipline of database management systems.
- To give a good formal foundation on the data models and E-R model.
- To demonstrate the principles database constraints behind systematic database design by covering normalization concept.
- To introduce the concepts of basic SQL as a universal Database language.
- To have an introductory knowledge about the PL/SQL concept

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Outline the necessity of database along with various Data models	Understanding
CO2	Express the ways to work with combined table using relational model	Applying
CO3	Applying normalization techniques and organize the order of storing data	Analyzing
CO4	Develop SQL and PL/SQL operations	Applying
CO5	Make use of the complex queries using SQL	Applying

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S		M	M											
CO2	S		M	M											
CO3	S		M	M											
CO4	S		M	M	M										
CO5	S		M	M	M										

S-Strong; M-Medium; L-Low

**UNIT – I: INTRODUCTION AND
DATABASE DESIGN MODEL**

6 HOURS

Introduction: Database System Applications - View of Data - Database Architecture. Database Design and the E-R Model: Overview of the Design Process - The Entity-Relationship Model - Constraints - Removing Redundant Attributes in Entity Sets - Entity Relationship Diagrams - Extended E-R Features.

UNIT – II: INTRODUCTION TO SQL

6 HOURS

Overview of SQL Query Language - SQL Data Definition - Basic Structure of SQL Queries - Additional Basic Operations - DDL, DML, TCL and DCL statements - SELECT Operations Set Operations - Null Values - Aggregate Functions - Nested Sub Queries - Modification of the Database

**UNIT - III: RELATIONAL DATABASE
DESIGN**

6 HOURS

Features of Good Relational Designs - Functional Dependency - Atomic Domains and First Normal Form – Second Normal Form - Third Normal Form - Boyce-Codd Normal Form - Multivalued Dependency and Fourth Normal Form - Join Dependency and Fifth Normal Form

**UNIT - IV: INTERMEDIATE AND PL/
SQL**

6 HOURS

Intermediate SQL: Join Expressions - Views - Materialized Views - Transactions - Commit - Rollback – Integrity Constraints - Assertions - SQL Data Types and Schemas - Authorization. PL/SQL: Introduction to PL/SQL-Variable-Constants-Conditional Statements-Cursor-Implicit Cursors-PL/SQL Explicit Cursors - PL/SQL Procedures - PL/SQL Functions - PL/SQL Exception Handling PL/SQL Triggers

**UNIT – V: TRANSACTIONS AND
CONCURRENCY CONTROL**

6 HOURS

Transactions: Transaction Concept - A Simple Transaction Model – Storage Structure - Transaction Atomicity and Durability - Transaction Isolation - Serializability. Concurrency Control: Lock Based Protocols - Timestamp Based Protocols - Validation Based Protocols

SUGGESTED READINGS

1. Silberschatz Abraham, Korth Henry F., and Sudarshan S, "Database System Concepts", 6 Edition, McGraw Hill Education, India, 2018.
2. Elmasri Ramez, Navathe Shamkant B, "Fundamentals of Database Systems", 7 Edition, Pearson Education, 2016.

3. Ramakrishnan Raghu, Gehrke Johannes, "Database Management Systems", 3 Edition, McGraw Hill Education,2014

WEBSITES

1. <http://www.digimat.in/nptel/courses/video/106105175/L01.html>
2. https://www.tutorialspoint.com/oracle_sql/index.htm

SEMESTER-IV
PROBABILITY AND STATISTICS

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 concepts in probability theory and the nature of uncertainty.
- To realize the applications of probability and commonly used probability distributions (both discrete and continuous), Central Limit theorem and their applications in various disciplines.
- To know the various techniques of descriptive and inferential statistics, and how to apply them for examining data in the analytical decision making.
- To draw conclusions based on sample data by constructing statistical hypothesis and estimation with statistical tools and techniques.
- To explain the foundations of probabilistic and statistical analysis which are mostly applied in computer science and to understand the index number concepts and its applications.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	To compute problems based on probability and conditional probability in appropriate ways.	Understand
CO2	To describe the probability distributions such as Binomial, Poisson, Normal distribution and Exponential distribution	Understand & Apply
CO3	To evaluate various measures of descriptive statistical measures for any given data.	Understand
CO4	To derive the relationship between data using Correlation, Rank Correlation and Regression for two variables.	Analyze
CO5	To understand the basic concept of index numbers and weighted index numbers which demonstrate to provide meaningful information in from the collected statistical data	Understand & Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4
CO1	S	S	M	L			M	M	M	M	M	M	M	
CO2	S	S	M	L			M	M	M	M	M	M	L	
CO3	S	S	M	M			L	M	M		L	M	M	
CO4	S	S	M	L			L	S	S		M	M	S	
CO5	S	S	M	L			L	M	M		L	S	L	

S-Strong; M-Medium; L-Low

UNIT I: Basics of Probability

8 HOURS

Trial, event -Sample space – Mutually exclusive event – Exclusive and exhaustive events – Dependent and independent events – Simple and compound events – Mathematical properties – Counting Principle for equally likely outcomes; probability rule -; Law of Total Probability, Addition and multiplication theorem, Combinations and Permutations. Conditional Probability Bayes Rule.

UNIT II : Discrete and Continuous Probability Distributions

8 HOURS

Random variables (discrete and continuous) - Mathematical expectation - Binomial distribution - Poisson distribution and its properties. Central Limit theorem, Uniform distribution - Normal distribution -conditions and properties, Standard normal distribution - Exponential distribution.

UNIT III : Basics of Statistics and Uni Variate Analysis

8 HOURS

Meaning and definition of statistics - Frequency Distribution, Concepts of measurement, scales of measurement of data, Different types scales (ratio, interval, nominal and ordinal); Measures of central tendency: Arithmetic Mean, Median, Mode. Measures of dispersion – Range, Coefficient of range - Quartile deviation - Coefficient of Quartile deviation - Standard deviation and Coefficient of variation.

UNIT IV: Bivariate Analysis

8 HOURS

Correlation – Meaning and definition - Scatter diagram –Karl Pearson’s Correlation Coefficient. Rank Correlation. Regression: Regression in two variables – Properties of Regression, uses of Regression

UNIT V : Index Numbers

8 HOURS

Definition – Types of Index numbers – Problems in the construction of index numbers – Construction of simple index numbers – Simple aggregate method and Simple average of price relatives using A.M, G.M – Construction of weighted index numbers – Laspeyre’s, Paasche’s, Dorbish Bowley’s, Marshall Edge worth and Fisher’s ideal index numbers - Simple problems

SUGGESTED READINGS

1. Evans James, R., (2017), Business Analytics, 2nd edition, Pearson Education, New Delhi.
2. Dinesh Kumar, U., (2017), Business Analytics: The Science of Data - Driven Decision Making, Wiley, New Delhi.
3. Srivastava T.N., and Shailaja Rego., (2012). 2nd Edition, Statistics for Management, McGraw Hill Education, New Delhi.
4. Sheldon Ross., (2007). Introduction to Probability Model, Ninth Edition, Academic Press, Indian Reprint.
5. Robert V. Hogg, Joseph W. McKean and Allen T. Craig., (2007). Introduction to Mathematical Statistics, Pearson Education, Asia.
6. Irwin Miller and Marylees Miller, John E. Freund, (2006). Mathematical Statistics with Application, Seventh Edition, Pearson Education, Asia.
7. Pillai R.S.N., and Bagavathi V., (2002). Statistics, S. Chand & Company Ltd, New Delhi.

WEBSITES

1. <https://ocw.mit.edu/courses/mathematics/18-05-introduction-to-probability-and-statistics-spring-2014/>
2. https://www.youtube.com/watch?v=COI0BUmNHT8&list=PLYqSpQzTE6M_JcleDbrVyPnE0PixKs2JE
3. <https://nptel.ac.in/courses/110107114/>
4. <http://172.16.25.76/course/view.php?id=1642>

SEMESTER-IV
PROGRAMMING IN PYTHON-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 develop simple programs using Python and packages.
- To develop python programs to solve mathematical and statistical problems
- To develop python visualization techniques using packages.
- To develop python program datasets
- To Understand draw charts using different data sets.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Understand the essentials of Python programming	Understand
CO2	Do basic programs using python modules and packages	understand
CO3	Create simple algorithms with and without using packages	Apply
CO4	Interpret algorithm and visualize the results with real time datasets	Analyze
CO5	Understand draw charts using different data sets.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S								L						
CO2	S			S					L						
CO3	S			M	M			S	L						
CO4	S			S	S			S	L						
CO5	S			S	M			S	L						

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS

30 HOURS

1. Expressions, conditionals, loops, list, dictionary, and strings.
2. Functions: scope, parameter passing.
3. Data objects, pass arrays to functions, return values .
4. Functions using libraries: mathematical, and string functions.
5. File handling: open and close a file, read, write,
6. File processing: append to a file, standard input, output, and error streams, relative and absolute paths.
7. Using Python libraries: create and import Python libraries
8. Recursion: simple algorithms with recursion: factorial, Fibonacci numbers;
9. Recursion on arrays: binary search .
10. Pandas: Importing package and Arrays .
11. Data visualization Pyplot: line chart, pie chart, and bar chart.
12. NumPy: Structured array and Sorting array.
13. Matplotlib: draw different charts for a data set.

SUGGESTED READINGS

1. Allen Downey, Jeffrey Elkner, Chris Meyers. How to think like a computer scientist learning with Python / 1st Edition, 2012
2. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning, ISBN: 978- 1111822705
3. Wesley J. Chun, “Core Python Applications Programming”, 3rd Edition , Pearson Education, 2016
4. Charles Dierbach, “Introduction to Computer Science using Python”, Wiley, 2015

WEBSITES

1. <http://docs.python.org/3/tutorial/index.html>
2. <http://interactivepython.org/courselib/static/pythons>
3. <http://www.ibiblio.org/g2swap/byteofpython/read/>

SEMESTER-IV

NETWORK SECURITY -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 Unix commands and shell programming.
- To implement various CPU Scheduling Algorithms.
- To implement Process Creation and Inter Process Communication.
- To implement Deadlock Avoidance and Deadlock Detection Algorithms.
- To implement Page Replacement Algorithms, File Organization and File Allocation Strategies.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Compare the performance of various CPU Scheduling Algorithms.	Understand
CO2	Implement Deadlock avoidance and Detection Algorithms.	Remember
CO3	Implement Semaphores.	Apply
CO4	Create processes and implement IPC.	Analyze
CO5	Analyze the performance of the various Page Replacement Algorithms.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S				M				S						
CO2	S				M				S						
CO3	S				M				S						
CO4	S				S				S						
CO5	S				M				S						

S-Strong; M-Medium; L-Low

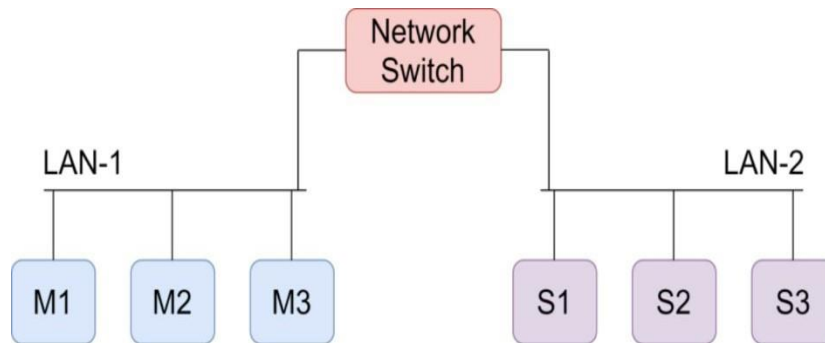
LIST OF PROGRAMS

30 HOURS

The experiments make use of Kali Linux distros and other open-source security tools.

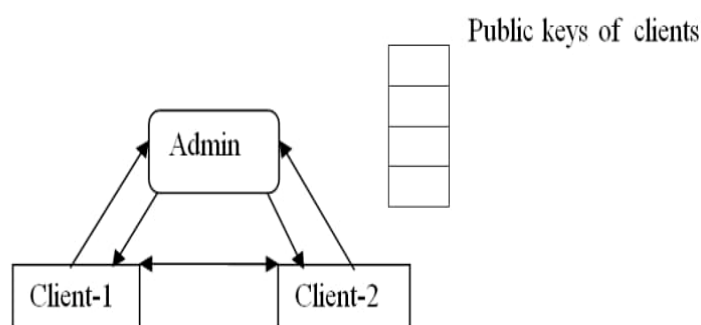
Install Kali Linux on Virtual Machine and most of the open-source tools are available along with Kali Linux

1. LAN based Network Security: Set up a simple LAN as shown in below figure. M1-3 and S1-3 are machine which have Linux and Windows running.



1. Configure LAN-1 and LAN-2 as separate VLANs in the network switch (use inter VLAN ACL).
2. Create a SPAN port in the network switch and send the mirrored traffic to a promiscuous mode port for the purpose of IDS and other packet analysis. Practice port based and VLAN based mirroring.
3. Familiarize with 802.1x, Network Admission Control, Microsoft NAP, RADIUS protocol, RADIUS per port ACL

2. Application of Cryptographic algorithms using Crypto tools : Establish a Client-Client Secure communication protocol as shown in below Figure



The Client machines (Client-1 and Client-2) and Admin machine are installed in different VMs. All the three machines are interconnected through a network switch with different IP addresses. The Admin runs a program that generates 2048 bit RSA public and private key for a Client that wants to communicate. Admin generates 2048 bit RSA public and private key for Client-1 and Client-2. The private keys are distributed to client machines and public keys are stored in a structure in the admin machine. When Client-1 wants to send message to Client-2,

it encrypts the messages with public key of Client-2. The message is decrypted by Client-2 with its private key. Similar communication pattern from Client-2 to Client-1 need to be maintained.

Manually capture the traffic between the hosts to ensure the proper working of the encryption. Construct an asynchronous communication between Client-1 and Client-2. Run a Wireshark/TCPdump at the SPAN/Promiscuous port of the network switch and identify the communication between the communicating entities (Admin, Client-1, and Client-2).

3. Network Security Lab: Network Packet analysis using Wireshark.

Use Wireshark to solve the below scenarios:

1. You, as a SOC analyst noted that someone try to send information (PING) to unknown IP address and you are suspecting some malicious information might transferred in it. Analyse the log file and find the data.
 - a) Find the source and destination IP of that log.
 - b) Find the Data length (Bytes) and verify the checksum status on destination.
2. Now you have found that some kind of file is been downloaded by insider in unencrypted web traffic. Your task is to
 - a) Find the type of file.
 - b) Export that file from that web traffic, then analyse the file for any secret information.
 - c) Find the hostname in which the file is stored.
3. Based upon their activities, auditing team has started investigation against them and found that the insider passed some sensitive information via call to someone. The traffic is been captured. Analyse the traffic and find those conversations and extract the sensitive information in it.
 - a) Find the call-ID when the status of the call is ringing.
4. On further investigation, you have a suspect on some wireless device communications. List out the Bluetooth devices communications from this traffic and find the details about native Bluetooth adapter.
5. Analyse the captured WPA handshake from this traffic and report in detail about it to your administrator.
 - a) Geo locate all the endpoint of wireless devices.
 - b) Analyse the protocol level information transfer between wireless devices.

4. Wireless Security Lab :

Perform a VA/PT on your local Wi-Fi network and try automated attacks with NetStumbler and Kismet to gather information wireless network and try attacks like CowPatty and Aircrack-ng. Further execute aircrack-ng to simulate attacks 802.11 WEP and WPA-PSK keys for auditing wireless networks and performing airodump, aircrack, airmon, airbase, aireplay and airtun

using Kali 2.0 (Sana) Linux. Attempt a Wi-Fi sniffing to gather location data which can be used to identify device parameters of wireless communication devices.

Tools Recommendation:

Firewall UTM Box – Fortigate 40F

Open Source SIEM – ELK (<https://www.elastic.co/elastic-stack>)

Kali Linux OS included with Burpsuite Community Version, OWASP ZAP, Metasploit, OpenVAS

BACHELOR OF COMPUTER APPLICATIONS
24VAC401

2024-2025

SEMESTER-III

UNIVERSAL HUMAN VALUES

2H-1C

Instruction Hours/week: L:2 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

NPTEL/SWAYAM COURSE

SEMESTER-V
DIGITAL IDENTITY ACCESS MANAGEMENT

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

- Identify the different models of access control and authentication factors.
- Identify different types of identities and the IAM framework.
- Understand LDAP models including information model, naming model, functional model, and security model.
- Explore multi-factor authentication (MFA) methods and principles.
- Explain the fundamentals of single sign-on (SSO) and its protocols (SAML, OAuth, OpenID Connect).

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Understand access control principles and identity management concepts.	Understand
CO2	Design and implement IAM strategies considering common challenges and key considerations.	Apply
CO3	Configure LDAP servers and perform basic operations.	Understand
CO4	Analyze the security and privacy considerations in implementing MFA.	Analyze
CO5	Design and implement federated systems for secure access.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S							S							
CO2	S						S		L						
CO3	S				S										
CO4	S		M										S		
CO5	S		L												

S-Strong; M-Medium; L-Low

UNIT I: Digital Security & Governance

9 HOURS

Access control & identity management, Identification, Authentication and Authorization, Classification of Information, Separation of Duties, need for strong credentials.

Access Controls: Models, Authentication Factors, Network Access Control

Security Governance: Managing Information Security, Organization and responsibilities, Information Security Governance, Security Incident Management, Application Security, Data and information Analyze, Role of databases and database management systems, Knowledge management systems and data warehouses, Secure Coding Practices, ISO 27001 - Domains, Introduction to SOX, HIPAA, CoBIT

UNIT II: Identity and Access Management

12 HOURS

Introduction to IAM: Introduction to IAM, Enterprise or Organizational Identities, Electronics and non-electronics Identities, AM Framework, Key Principles, and Definitions, Common Challenges and Key Considerations, IAM Roadmap and Strategy

Implementation: Implementation Methodology and Approach, Access Request, Approval, and Provisioning Enforcement : Authentication, Authentication Implementation Approaches, Authorization, Logging and Monitoring

Access Review and Certification: Benefits and Objectives, Access Review and Certification Processes

Roles and Rules: Rules and Enforcement, The RBAC Model and the Access Management Life Cycle, RBAC Implementation Considerations, Guiding Principles and Lessons Learned

Privileged Access Management: Understanding Privileged Access, Key Business Drivers, Privileged Access Management Program

UNIT III: Directory Services

12 HOURS

The LDAP Protocol, LDAP Basics: Objects in LDAP, Object Classes, Attributes, and Schema, Server Configuration, First Steps with LDAP, Updating a Directory with a Batch Process, The LDIF Standard

LDAP Models: Information Model (Object classes, Object Identities, Attributes, Matching Rules) Naming model, Functional Model (LDAP operations), Security Model (Authentication and Authorization)

Directory Architectures: Introduction to Replication and Partitioning, Data Distribution between LDAP and Non-LDAP Systems, Partitioning, Replication, Data Distribution between LDAP and Non-LDAP Systems

UNIT IV: Secured Access Paradigms: Exploring Multi-Factor Authentication 8 HOURS

Multi-Factor Authentication (MFA): Introduction to Authentication Methods, Principles of Multi-Factor Authentication, Biometrics and Behavioural Authentication, Security and Privacy Considerations in MFA, Implementing MFA in Different Environments

UNIT V: Federated Systems and SSO 7 HOURS

Federated Systems and SSO: Introduction to Federated Identity, Federated Identity Standards and Protocols, Design and Implementation of Federated Systems

Single Sign-On: Fundamentals of Single Sign-On, Single Sign-On Protocols (SAML, OAuth, OpenID Connect), Implementing SSO in Different Environments, SSO Security Best Practices

SUGGESTED READINGS

1. Ertem Osmanoglu. Identity and Access Management, Released November 2013
2. Reinhard E. Voglmaier, The ABCs of LDAP, Released November 2003
3. James F. Penrose. "Multi-Factor Authentication: Strategies and Implementation
4. Mark D. Osborn. Federated Identity Management: Concepts and Practices
5. Laura E. Peterson. Single Sign-On Solutions: Security, Implementation, and Best Practices
6. Mike Chapple, Access Control and Identity Management, 3rd Edition, Released October 2020
7. Brooks, Charles J., Christopher Grow, Philip Craig, and Donald Short. Cybersecurity essentials. John Wiley & Sons, 201
8. Thomas R. Peltier, Information Security Risk Analysis, CRC Press; 2001
9. Whitman, M. and Mattord, H., Principles of Information Security, Second Edition, Boston: Thomson Course Technology; 2008

SEMESTER-V

SOFTWARE ENGINEERING & SUSTAINABLE DEVELOPMENT GOALS

5H-4C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To introduce the fundamental concepts of software engineering.
- To Analyze, specify and document software requirements for a software system.
- To Design, select and apply the most appropriate software engineering process for a given project, plan for a software project, identify its scope and risks, and estimate its cost and time.
- To learn about the overview of sustainable development goals

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Identify suitable life cycle models to be used and translate a requirement specification to a design using an appropriate software engineering methodology.	Understand
CO2	Apply systematic procedure for software design and deployment.	Apply
CO3	Analyze a problem and identify and define the computing requirements to the problem.	Analyze
CO4	Formulate appropriate testing strategy for the given software system.	Analyze
CO5	Understand the overview of sustainable development goals	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S									L					
CO2	S	S													
CO3	S														
CO4	S		S		L										
CO5	S				L	M									

S-Strong; M-Medium; L-Low

UNIT I : INTRODUCTION**12 HOURS**

The Evolving Role of Software, Software Characteristics, Changing Nature of Software, Software Engineering as a Layered Technology, Software Process Framework, Framework and Umbrella Activities, Process Models, Capability Maturity Model Integration (CMMI).

UNIT II : REQUIREMENT ANALYSIS**12 HOURS**

Initiating Requirement Engineering Process- Requirement Analysis and Modeling Techniques- Flow Oriented Modeling- Need for SRS- Characteristics and Components of SRS- Software- Project Management: Estimation in Project Planning Process, Project Scheduling.

UNIT III : HTML CONCEPTS**12 HOURS**

Software Risks, Risk Identification Risk Projection and Risk Refinement, RMMM plan, Metrics for Process and Projects- Design Concepts, Architectural Design Elements, Software Architecture, Data Design at the Architectural Level and Component Level, Mapping of Data Flow into Software Architecture, Modeling Component Level Design

UNIT IV : TESTING STRATEGIES & TACTICS**12 HOURS**

Software Testing Fundamentals, Strategic Approach to Software Testing, Test Strategies for Conventional Software, Validation Testing, System testing Black-Box Testing, White-Box Testing- Performance Testing-Stress Testing – Scalability Testing – Soak Testing-Spike Testing. Agile Testing Functional testing concepts, Equivalence class partitioning, Boundary value analysis, Decision tables, Random testing, Error guessing.

UNIT V : SUSTAINABLE DEVELOPMENT**12 HOURS**

Introduction to Sustainable Development- Sustainable Development Goals- Synergies and trade-offs among different SDGs- Balancing the three pillars of sustainable development - Sectoral Approaches to Sustainable Development.

SUGGESTED READINGS

1. Pressman, R.S. 2019. Software Engineering: A Practitioner's Approach. 7th edition. New Delhi:McGraw-Hill.
2. Jalote, P. 2018. An Integrated Approach to Software Engineering. 2nd edition. New Delhi: New Age International Publishers.
3. Aditya P. Mathur,2018. Foundations of Software Testing _ Fundamental Algorithms and Techniques, Dorling Kindersley (India) Pvt. Ltd., Pearson Education.
4. Aggarwal, K.K., & Singh, Y. 2017. Software Engineering. 2nd edition. New Delhi: New Age International Publishers.

5. Julia Walker, Alma Pekmezovic, and Gordon Walker, Sustainable Development Goals: Harnessing Business to Achieve the SDGs through Finance, Technology and Law Reform, 1st Edition (2019), Wiley.

WEBSITES

1. http://en.wikipedia.org/wiki/Software_engineering
2. <http://www.onesmartclick.com/engineering/software-engineering.html>
3. <https://nptel.ac.in/courses/106105087/>

SEMESTER-V
PHP PROGRAMMING

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 (CO)

- To understand how server-side programming works on the web.
- To learn PHP Basic syntax for variable types and calculations.
- To use PHP built-in functions and creating custom functions
- To understand String Manipulation and Regular Expression.
- To receive and process Arrays.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Write PHP scripts to handle HTML forms.	Apply
CO2	Write regular expressions including modifiers, operators, and metacharacters	Apply
CO3	Create PHP programs that use various PHP library functions, and that manipulate files and directories.	Apply
CO4	Analyze and manipulate Strings and regular expression	Analyze
CO5	Analyze and understand the usage of various types of Arrays by writing PHP programs	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S	L		L	L				L	M					
CO2	S			M	M				L	M					
CO3	S			M	M				L	M					
CO4	S			M	M				L	M					
CO5	S			M	M				L	M					

S-Strong; M-Medium; L-Low

UNIT I **10 HOURS**

Introduction to PHP: PHP introduction, inventions and versions, important tools and software requirements (like Web Server, Database, Editors etc.) -PHP with other technologies, scope of PHP -Basic Syntax, PHP variables and constants -Types of data in PHP, Expressions, scopes of a variable (local, global)-PHP Operators.

UNIT II **10 HOURS**

PHP Form Introduction- Form Handling - Capturing Form Data-GET and POST form methods-Dealing with multi value fields Redirecting a form after submission - **PHP Form Validation** -Email, Name - **PHP conditional events and Loops:** PHP branching statements - Looping Statements.

UNIT III **10 HOURS**

PHP Function: Function, Need of Function, declaration and calling of a function -PHP Function with arguments, Default Arguments in Function -Function argument with call by value, call by reference, Recursive function -Built-in Functions- Scope of Function Global and Local, PHP Cookies and Sessions.

UNIT IV **9 HOURS**

String Manipulation and Regular Expression: Creating and accessing String, Searching & Replacing String -Formatting, joining and splitting String, String Related Library functions-Use and advantage of regular expression over inbuilt function -Use of functions in regular expression

UNIT V **9 HOURS**

Array: Anatomy of an Array, Creating index based and Associative array, Accessing array-Looping with Index based array, with associative array using each() and foreach()-Some useful Library function.

SUGGESTED READINGS

1. David Sklar, Adam Trachtenberg, 2019. PHP Cookbook: Solutions & Examples for PHP.
2. Robin Nixon, 2018. Learning PHP, MySQL, JavaScript, CSS & HTML5, (3rd ed.) Paperback, O'reilly.
3. Timothy Boronczyk, Martin E. Psinas, 2016. PHP and MYSQL (Create-Modify-Reuse), Wiley India Private Limited.
4. Steven Holzner, 2016. PHP: The Complete Reference Paperback, McGraw Hill Education (India).

WEBSITES

1. www.php.net/
2. http://www.nptelvideos.com/php/php_video_tutorials.php
3. www.w3schools.com/PHP/default.asp

SEMESTER-V
.NET PROGRAMMING

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 understand .NET framework to develop web centric applications.
- To enable students to learn the basics of I/O and object oriented programming.
- To familiar with VB.NET and ASP.NET IDE
- To learn about the ASP.NET controls and ADO.NET.
- To enable the students to learn how to build and deployment of web services.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Understand the basics of .NET framework and the object oriented programming.	Undersatnd
CO2	Understand the procedures, File I/O, Error handling and Message queues.	Understand
CO3	Understand and remember the components in VB.NET IDE, ADO.NET and also the window forms.	Understand
CO4	Apply the HTML server controls, Web controls, Validation controls and state management and tracing.	Apply
CO5	Analyze on SOAP, building web services and deploying and publishing web services, Finding and consuming web services.	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S		L		L				L	M					
CO2	S		L		M				L	M					
CO3	S		L		M				L	M					
CO4	S		L						L	M					
CO5	S		L						L	M					

S-Strong; M-Medium; L-Low

UNIT I

10 HOURS

Introduction to .NET: .NET framework features & architecture, CLR, common Type system, MSIL, Assemblies and class libraries. Introduction to visual studio, Project basics, types of project in .Net, IDE of VB .Net – Menu bar, Tool bar, Solution Explorer, Toolbox, Properties Window, Form Designer, Output Window, Object browser. The environment: Editor tab, format tab, general tab, docking tab. Visual development & event driven programming – Methods and events.

UNIT II

10 HOURS

VB .Net Language: The VB .Net Language – Variables- declaring variables, Data type of variables, forcing variables declarations, scope & lifetime of a variable, constants, arrays, types of arrays, control array, Structure programming – Modularity – Information hiding – abstraction – events – subroutines and functions – message box – input box. Control flow statement: conditional statement, loop statement.

UNIT III

10 HOURS

Basic Windows Controls: Textbox Control- List Box, Checked List Box-Scrollbar and Track Bar Controls-More Windows Control-The common Dialog Controls-The Rich Text Box Control - Handling Strings, characters and Dates. The Tree View and List View Controls: Examining the Advanced Controls-The Tree View Control-The List View Control.

UNIT IV

9 HOURS

Working with Forms : Loading, showing and hiding forms, controlling One form within another. Using MDI form. **Working with Menus:** creating menu, inserting, deleting, assigning short cut keys, pop up menu .Windows Form Control (with Properties, Methods and events). **Built-in Dialog Box:** Open File Dialog, Save File Dialog, Font Dialog, Color Dialog, Print Dialog, Printing.

UNIT V

9 HOURS

Database programming with ADO: .Net: overview of ADO, from ADO to ADO .Net, accessing data using server explorer. Creating connection, command, data adapter and data set with OLEDB and SQLDB. Display data on data bound controls, display data on a data grid. Generate reports using Crystal Report Viewer.

SUGGESTED READINGS

1. Evangelos Petroustos, 2019. Mastering Visual Basic.Net, BPB Publications, New Delhi.
2. Ying Bai,2018. Practical Database Programming with Visual Basic.Net 2nd Edition, John Wiley & Sons Publication, Canada
3. Shirish Chavan. 2017. Visual Basic.Net, 1st Edition, Pearson Education, New Delhi.
4. VB.Net in Nutshell 2016. 2nd Edition. Steven Roman, Paul Lomax, O'Reilly

WEBSITES

1. www.microsoft.com/NET/
2. www.en.wikipedia.org/wiki/.net
3. www.vbtutot.com

SEMESTER-V
BUSINESS COMMUNICATION

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 understand the importance of Business Communication
- To develop the capacity to draft letters to different corporate entities
- To familiar with report writing
- To learn and understand the various vocabulary entities used in business communication
- To enable the media

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Understand the fundamental concepts of business communication	Understand
CO2	Develop skills in business correspondence by learning the principles of letter writing.	Understand
CO3	Gain knowledge in report writing and understanding its importance	Understand
CO4	Enhance business vocabulary, and understanding key business term.	Apply
CO5	Analyze the various media of communication and their advantages and disadvantages.	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S	S													
CO2	S	S													
CO3	S		S		S										
CO4	S	M													
CO5	S									S					L

S-Strong; M-Medium; L-Low

UNIT I : BASIC CONCEPTS OF BUSINESS COMMUNICATION **11 HOURS**

Meaning, Nature, Scope, Definition of Communication -Types of Communication - Purpose of Business Communication -Channels of Business Communication Barriers to communication Verbal, Non-Verbal, Formal, Informal communication.

UNIT II : BUSINESS CORRESPONDENCE **11 HOURS**

Principles of Letter Writing- Format of Business, Types of Business letter, Inquiry letter, complaint letter, Persuasive letter - Letter lay-out, Essentials of an effective letter writing-- Circulars, Application for Employment and Resume, Notices, Agenda, Memo, E-mail Etiquette.

UNIT III : REPORT WRITING **9 HOURS**

What is report-Importance of Reports-Types of reports-Characteristic of good report selecting suitable types of Reports-Process of Writing a Report -Precis Writing.

UNIT IV : VOCABULARY FOR BUSINESS WRITING **9 HOURS**

Some Business Terms-I-Some Business Terms-II-Words Often Confused-Words Often Misspelt.

UNIT V : MEDIA OF COMMUNICATION **8 HOURS**

Introduction, Advantages and Disadvantages of – Telex, Telegram, Fax, Voice Mail, Teleconferencing, Videoconferencing and Conference Calls, SIM Card, Dictaphone, SMS, MMS, Internet and Social Media Sites - Preparing for Job Market.

SUGGESTED READINGS

1. Monippally, Matthukutty, M. Business Communication Strategies. New Delhi: Tata McGraw-Hill Publishing Company Ltd., 2001
2. Ajmani, J. C. Good English: Getting it Right. New Delhi: Rupa Publications, 2012.
3. Bovee, Courtland L, John V. Thill & Barbara E. Schatzman. Business Communication Today: Tenth Edition. New Jersey: Prentice Hall, 2010.
4. Hasson, Gill. Brilliant Communication Skills. Great Britain: Pearson Education, 2012
5. M K Sehgal, Vandana Khetarpal. Business Communication. India: Excel Books, 2008.

WEBSITES

1. <http://networketiquette.net/>
2. <https://www.dailywritingtips.com/>
3. <http://www.thehumorsource.com>

SEMESTER-V
CASE TOOLS – 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 (CO)

- To understand and identify the functional and non-functional requirements of the given system.
- To analyze the requirements for the system.
- To design the system architecture and database for managing reservations, schedules, and availability
- To design and implement essential ATM operations like withdrawals, deposits, balance inquiries, and fund transfers.
- To create user-friendly interfaces for composing, reading, and organizing emails..

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Identify the functional and non-functional requirements of the given system.	Apply
CO2	Analyze the requirements for the system.	Create
CO3	Design the system architecture and database for managing reservations, schedules, and availability	Apply
CO4	Implement essential ATM operations like withdrawals, deposits, balance inquiries, and fund transfers.	Create
CO5	Develop user-friendly interfaces for composing, reading, and organizing emails.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S			S						M					
CO2	S				S				L						
CO3	S				M										
CO4	S								L	M					
CO5	S				S										

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS

48 HOURS

1. Student Marks Analyzing System.
2. Quiz System.
3. Payroll System.
4. Online Ticket Reservation System.
5. ATM Systems.
6. Course Registration System.
7. E-mail Client System.
8. Platform assignment system for the trains in a railway station.
9. Stock maintenance System.
10. Library management System.

SUGGESTED READINGS

1. Software Engineering: A Practitioner's Approach, Roger S. Pressman and Bruce R. Maxim, 9th Edition (2019), McGraw-Hill Education
2. Systems Analysis and Design by Scott Tilley, 12th Edition (2019), Cengage Learning
3. Modern Systems Analysis and Design, Jeffrey A. Hoffer, Joey F. George, and Joseph S. Valacich, 9th Edition (2020), Pearson
4. Object-Oriented Systems Analysis and Design Using UML, Simon Bennett, Steve McRobb, and Ray Farmer, 5th Edition (2014), McGraw-Hill Education
5. Software Architecture in Practice, Len Bass, Paul Clements, and Rick Kazman, 4th Edition (2021), Addison-Wesley Professional

WEBSITES

1. <https://www.ibm.com/products/rational>
2. <https://www.lucidchart.com/>
3. <http://staruml.io/>

SEMESTER-V
PHP PROGRAMMING – 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 (CO)

- To understand how server-side programming works on the web.
- To learn PHP Basic syntax for variable types and calculations.
- To use PHP built-in functions and creating custom functions
- To understand POST and GET in form submission.
- To create a database in phpMyAdmin, to read and process data in a MySQL database

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Write PHP scripts to handle HTML forms.	Apply
CO2	Write regular expressions including modifiers, operators, and metacharacters.	Apply
CO3	Create PHP programs that use various PHP library functions, and that manipulate files and directories.	Apply
CO4	Analyze and solve various database tasks using the PHP language.	Analyze
CO5	Analyze and solve common Web application tasks by writing PHP programs	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S		L	L	L				L	M					
CO2	S		L	L	M				L	M					
CO3	S		L	M	M				L	M					
CO4	S		L	M	M				L	M					
CO5	S		L	M	M				L	M					

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS

60 HOURS

1. Simple programs using PHP
2. Program with control and looping structures.
3. Program on User defined PHP functions
4. PHP program using regular expression and string manipulation
5. PHP program using arrays and objects
6. Develop a PHP application using inheritance and interface
7. Develop a program in PHP session handling
8. PHP program to trace errors and exceptions
9. Connect the Web page to MySQL database
10. Create a web page to automate the sales and marketing system

SUGGESTED READINGS

1. David Sklar, Adam Trachtenberg, 2014. PHP Cookbook: Solutions & Examples for PHP.
2. Luke Welling, Laura Thompson, 2008. PHP and MySQL Web Development, (4th ed.), Addison Paperback, Addison-Wesley Professional.
3. Welling, Luke, "PHP and MYSQL Web Development", 3rd Edition, Pearson Education, New Delhi, 2005
4. Schlossnagle, George, "Advanced PHP Programming", Pearson Education, New Delhi, 2004.

WEBSITES

1. www.php.net/
2. www.w3schools.com/PHP/default.asp

SEMESTER-V
.NET PROGRAMMING - 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 create windows forms using arrays and flow control statements.
- To Learn Basic windows controls using Visual Basic.Net
- To learn the classes and namespaces in the .NET Framework class library.
- To Develop Web Applications using Microsoft ASP.NET programming.
- To Understand the concept of Multiple Document Interface and the architecture of .NET
- To assemble multiple forms, modules, and menus into working VB.NET solutions

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	Remember
CO2	Learn various tools in .net applications	Understand
CO3	Implement ADO.Net concept in VB.Net and ASP.Net applications	Understand
CO4	Create server-side web applications using ASP.NET	Apply
CO5	Apply techniques to develop error-free software	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S		M	S					L	M					
CO2	S		S	L					L	M					
CO3	S		S	M					L	M					
CO4	S		S	M					L	M					
CO5	S		S	M					L	M					

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS

60 HOURS

VB.Net

1. Design a program for a various font application.
2. Design a form to create a calculator application
3. Write a program for a notepad application
4. Write a program to prepare employee payroll details
5. Design a windows application to display, add, delete & edit information from database.

ASP.Net

6. Write a program to create an on-line quiz using content page holder.
7. Design a web Application form and validate it
8. Design a Online Recruitment system
9. Design a College Website
10. Design a web page to display, add, delete & edit information from database.

SUGGESTED READINGS

1. Visual Basic 6.0 Programming, Content Development Group, TMH, 8th reprint, 2007.
2. Programming with Visual Basic 6.0, Mohammed Azam, Vikas Publishing House, Fourth Reprint, 2006.
3. Gray Cornell (2003), "Visual Basic 6 from ground up" TMH, New Delhi, 1st Edition,
4. VB.Net in Nutshell 2016. 2nd Edition. Steven Roman, Paul Lomax, Oreilly
5. Deitel and Deitel, T.R.Nieto (1998), "Visual Basic 6 – How to Program", Pearson Education. First Edition.

WEBSITES

1. www.microsoft.com/NET/
2. www.en.wikipedia.org/wiki/.net
3. www.vbtutot.com
4. <https://freevideolectures.com/course/3002/dot-net-tutorial>
5. <https://www.nptelvideos.com/video.php?id=1760&c=21>

BACHELOR OF COMPUTER APPLICATIONS

2024-2025

24CAUE501

SEMESTER-V

ELECTIVE MAJOR

4H-3C

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

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

SEMESTER-V
SUMMER INTERNSHIP

SEMESTER-VI
CLOUD COMPUTING

6H-5C

Instruction Hours/week: L:6 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- Learn to identify the basic concepts, policies, and technologies of Cloud
- Learn to identify the impact of a Cloud architecture and Cloud Platforms.
- Learn the objectives of Cloud storage provides and applications.
- To be familiar with the concepts of cloud computing /performance issues in storage.
- Learn about Cloud applications

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Understand the fundamentals and essentials of Cloud Computing.	Understand
CO2	Understand the foundation of the cloud computing so that they can start using and adopting Cloud Computing services and tools in their real life scenarios.	Apply
CO3	Understand and design the Cloud Computing environment.	Understand
CO4	Understand the various Cloud storage providers in the world.	Analyze
CO5	Acquire the knowledge about the cloud applications	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S		L					S		S					
CO2	S	S		S						S					
CO3	S		L	S	S	M									
CO4	S		L		S	S									
CO5	S			S	S					S					

S-Strong; M-Medium; L-Low

UNIT I **12 HOURS**

Cloud Computing at a Glance - Historical Developments - Building Cloud Computing Environments - Computing Platforms and Technologies Parallel vs. Distributed Computing - Elements of Parallel Computing - Elements of Distributed Computing - Technologies for Distributed Computing.

UNIT II **12 HOURS**

Virtualization: Characteristics - Virtualization Techniques - Virtualization and Cloud Computing - Pros and Cons of Virtualization. **Cloud Computing Architecture:** Cloud Reference Model - Types of Clouds - Economics of Clouds, Open challenges.

UNIT III **12 HOURS**

Concurrent Computing-Thread Programming: Programming applications with Threads - Multithreading with Aneka - Programming applications with Aneka threads. **High Throughput Computing-Task Programming:** Task Computing - Task-based Application Models – Aneka Task-Based Programming

UNIT IV **12 HOURS**

Data Intensive Computing –Map-Reduce Programming: Introduction - Technologies for data-intensive computing - Aneka MapReduce Programming. **Cloud Platforms in Industry:** Amazon Web Services - Google App Engine - Microsoft Azure.

UNIT V **12 HOURS**

Cloud Applications: Scientific Applications: Healthcare – Biology - Geo-science. **Business Applications:** CRM and ERP – Productivity - Social Networking. Media Applications - Multiplayer Online Gaming. **Advanced Topics in Cloud Computing:** Energy Efficiency in Clouds - Market Based Management of Clouds - Federated Clouds / InterCloud - Third Party Cloud Services.

SUGGESTED READINGS

1. “Mastering Cloud Computing Foundations and Applications Programming”, RajKumar Buyya, Christian Vecchiloa, S. Thamarai Selvi, TMH Publications,
2. “Cloud Computing a Practical Approach”, Velte Anthony and Velte T.J Elsenpeter, 1st Edition, 2010, Tata McGraw Hill Pvt Ltd, New Delhi.
3. “Cloud Computing with the Windows Azure Platform”, Lennings Roger, Wiley India Pvt. Ltd, 2010, New Delhi.
4. Cloud Computing: Concepts, Technology, and Architecture – By Zaigham Mahmood, Ricardo Puttini, and Thomas Erl.

WEBSITES

1. http://docwiki.cisco.com/wiki/Introduction_to_cloud_Technologies
2. [www.w3schools.com/cloud computing/default.asp](http://www.w3schools.com/cloud_computing/default.asp)
3. <http://www.engppt.com/2009/12/cloud-computing-ppt-slides.html>

SEMESTER-VI
BLOCK CHAIN TECHNOLOGY

6H-4C

Instruction Hours/week: L:6 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To introduce students to the concepts and techniques of Blockchain Technology.
- To understand a conceptual element for Blockchain.
- To summarize the major developments related to blockchain and cryptocurrencies.
- To apply the protocols for optimize the models learned and report on the expected accuracy that can be achieved by applying the models.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Understand the security and performance perspective of blockchain technology	Understand
CO2	Learn and apply security analysis and performance-enhancing techniques related to blockchain.	Learn
CO3	Understand the real-life applications of blockchain technology and apply it to provide solutions to some real-life problems.	Understand
CO4	Categorize the various types of blockchains	Categorize
CO5	Evaluate alternative Blockchains and their applicability.	Evaluate

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S		S		S			S		S			S		
CO2	S			S		S		S							S
CO3	S		S	S		S	S	S	S						
CO4	S				S										
CO5	S		S	S	S	M									M

S-Strong; M-Medium; L-Low

UNIT I : INTRODUCTION TO BLOCKCHAIN **12 HOURS**

Introduction to Blockchain history: Digital Money to Distributed Ledgers Design Primitives: Protocols, Security, Consensus, Permissions, Privacy. Blockchain Architecture and Design. Basic crypto primitives: Hash, Signature, Hashchain to Blockchain, Basic consensus mechanisms

UNIT II : NETWORK SECURITY MODELS **12 HOURS**

Network Security, Different type of network attack, Warm hole attack, byzantine attack, network based attack etc, Trust based Secure routing schemes.

UNIT III : BITCOIN & BLOCKCHAIN **12 HOURS**

Bitcoin & Blockchain: Blockchain Structure, Basic Operations, Beyond Bitcoin, Gas, minor's role in blockchain. Ethereum Blockchain: Smart Contracts, Ethereum Structure, Ethereum Operations, Incentive Model in blockchain.

UNIT IV : CRYPTOGRAPHY AND CRYPTOCURRENCY **12 HOURS**

Cryptography and cryptocurrency: Algorithms & Techniques Public-Key Cryptography, Public key and private key combinations in Blockchain security, Hashing, Transaction Integrity, Securing Blockchain. Blockchain in Financial Software and Systems (FSS):Settlements, KYC, Capital markets, Insurance Use case II: Blockchain in trade supply chain: Provenance of goods, visibility, trade supply chain finance, invoice management discounting, etc.

UNIT V : PRIVACY AND SECURITY ON BLOCKCHAIN **12 HOURS**

Blockchain Cryptography Privacy and Security on Blockchain, Blockchain consensus protocols, Various recent works on scalability. Secure cryptographic protocols on Blockchain Secured, Multi-party Computation, Blockchain, for science: making better use of the data-mining network, Case Studies: Comparing Ecosystems - Bitcoin, Hyperledger, Ethereum and more

SUGGESTED READINGS

1. Melanie Swan, "Block Chain: Blueprint for a New Economy", O'Reilly, first edition – 2015
2. Daniel Drescher, "Block Chain Basics", Apress; 1st edition, 2017.
3. Anshul Kaushik, "Block Chain and Crypto Currencies", Khanna Publishing House, Delhi.

WEBSITES

1. <https://ai.google/education/>
2. <https://docs.docker.com/get-started/https://console.ng.bluemix.net/docs/services/block%2520chain/index.html>
3. [https://developer.ibm.com/patterns/create-and-deploy-block chain-network-usingfabric-sdk-java/](https://developer.ibm.com/patterns/create-and-deploy-block-chain-network-usingfabric-sdk-java/)

SEMESTER-VI
MACHINE LEARNING

6H-4C

Instruction Hours/week: L:6 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

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

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Explain the regression methods, classification methods and clustering methods.	Explain
CO2	Design and implement deep learning architectures for solving real life problems	Design
CO3	Understand the basic concepts and techniques of Machine Learning.	Understand
CO4	Learn algorithmic topics of machine learning and mathematically deep enough to introduce the required theory	Learn
CO5	Understand the inference and learning algorithms of K-mean Model.	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S		S		S				L	S					
CO2	S			S	S			M	L						
CO3	S		S	S	S			M	L						
CO4	S		S	S	S			M	L						
CO5	S		S	S	S			M	L						

S-Strong; M-Medium; L-Low

UNIT I

12 HOURS

Introduction to Machine Learning: Introduction – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search- Statistical Decision Theory - Regression, Classification, Bias Variance – Linear Discriminants – Perceptron – Linear Separability – Linear Regression.

UNIT II

12 HOURS

Machine Learning Models: Linear Models – Linear Regression, Multivariate Regression, Subset Selection, Shrinkage Methods- Multi-Layer Perceptron – Going Forwards – Going Backwards: Back Propagation Error – Multi-Layer Perceptron in Practice – Examples of using the MLP – Overview – Radial Basis Functions and Splines – Concepts – RBF Network – Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines.

UNIT III

12 HOURS

Neural Networks: Introduction, Early Models, Perceptron Learning, Backpropagation, Initialization, Training & Validation, Parameter Estimation - MLE, MAP, Bayesian Estimation- Stopping Criterion & Pruning loss functions, Categorical Attributes- Instability Evaluation Measures- Gradient Boosting, Random Forests, Multi-class Classification, Naive Bayes, Bayesian Networks.

UNIT IV

12 HOURS

Tree and Probabilistic Models: Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers - Probability and Learning – Data into Probabilities – Basic Statistics – Gaussian Mixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms – Vector Quantization – Self Organizing Feature Map.

UNIT V

12 HOURS

Graphical Models – Markov Chain Monte Carlo Methods – Sampling —Markov Chain Monte Carlo –Graphical Models – Bayesian Networks – Hidden Markov Models – Tracking Methods- Partitional Clustering, Hierarchical Clustering, Birch Algorithm, CURE Algorithm, Density-based Clustering- Machine Learning Case Studies in Technology- Machine Learning Case Studies on American Cancer Society on Google Cloud ML Engine.

SUGGESTED READINGS

1. Ethem Alpaydin, - Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014.
2. Charu C. Aggarwal - Neural Networks and Deep Learning , 1st Kindle Edition,2018.

3. Kevin P. Murphy - “Probabilistic Machine Learning: An Introduction”,2022.
4. Jayabalaji K.A, Hema Ambiha A, Preethi D, Mydhili S K, Machine Learning, 2023.

WEBSITES

1. <https://ai.google/education/>
2. <https://machinelearningmastery.com/>
3. <https://www.tensorflow.org/>

SEMESTER-VI
BLOCK CHAIN 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

- Knowledge of Blockchain Concepts and creating basic blocks.
- Proficiency in Blockchain Development.
- Ability to Design and Implement Blockchain Applications.
- Evaluation and Analysis of Blockchain Systems.
- Knowledge of crypto currency and creating a basic form of it.

Course Outcomes

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

Cos	Course Outcomes	Blooms Level
CO1	Understanding Block chain Fundamentals and creating basic blocks.	Apply
CO2	Able to Develop Block chain Applications in a structured manner.	Analyze
CO3	Able to Develop and test smart contract on Ethereum test networks	Analyze
CO4	Ability to create own crypto currency and get familiarity with future currencies.	Apply
CO5	Able to Evaluate and Analyze Block chain Systems.	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S				S			S		S					
CO2	S			S		S	S	S							
CO3	S			S	M	M		L							
CO4	S			M	M	M		L							
CO5	S		S	S	S						L				L

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS

40 HOURS

1. Creation of Block
2. Blockchain implementation
3. Develop and test smart contract on Ethereum test networks
4. Write and deploy chain code in Hyperledger Fabric
5. Mining in Blockchain
6. Peer-to-Peer implementation using Blockchain
7. Creating Crypto-currency Wallet

SUGGESTED READINGS

1. Melanie Swan, “Block Chain: Blueprint for a New Economy”, O’Reilly, first edition – 2015
2. Daniel Drescher, “Block Chain Basics”, Apress; 1st edition, 2017.
3. Anshul Kaushik, “Block Chain and Crypto Currencies”, Khanna Publishing House, Delhi.

WEBSITES

1. <https://ai.google/education/>
2. <https://docs.docker.com/get-started/https://console.ng.bluemix.net/docs/services/block%2520chain/index.html>
3. [https://developer.ibm.com/patterns/create-and-deploy-block chain-network-usingfabric-sdk-java/](https://developer.ibm.com/patterns/create-and-deploy-block-chain-network-usingfabric-sdk-java/)

SEMESTER-VI
MACHINE LEARNING 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 introduce students to the basic concepts and techniques of Machine Learning
- To develop skills of using recent machine learning software for solving practical problems
- To gain experience of doing independent study and research.
- Make use of Data sets in implementing the machine learning algorithms
- Implement the machine learning concepts and algorithms in any suitable language of choice

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Apply structured thinking to unstructured problems	Apply
CO2	Design and evaluate the unsupervised models through python in built functions.	Analyze
CO3	Understand the mathematical and statistical prospective of machine learning algorithms through python programming	Understand
CO4	Design and apply various reinforcement algorithms to solve real time complex problems.	Apply
CO5	Develop an appreciation for what is involved in learning from data	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S		S	S	M				L						
CO2	S			S	S				L	M					
CO3	S		S	S	L				L						
CO4	S			S	S			L	L						
CO5	S		S		S				L						

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS

40 HOURS

1. Write a python program to import and export data using Pandas library functions
2. Develop Decision Tree Classification model for a given dataset and use it to classify a new sample.
3. Write a python program to implement K-Means clustering Algorithm
4. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
5. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample
6. Develop Decision Tree Classification model for a given dataset and use it to classify a new sample.
7. Build Artificial Neural Network model with back propagation on a given dataset.
 - a) Implement Random forest ensemble method on a given dataset.
 - b) Implement Boosting ensemble method on a given dataset.
8. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem
9. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points.
10. Build an Artificial Neural Network by implementing the Back-propagation algorithm and test the same using appropriate data sets.
11. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file.
12. Build Artificial Neural Network model with back propagation on a given dataset.

SUGGESTED READINGS

1. C. M. Bishop. Pattern Recognition and Machine Learning. First Edition. Springer, 2006. (Second Indian Reprint, 2015).
2. P. Flach. Machine Learning: The Art and Science of Algorithms that Make Sense of Data. First Edition, Cambridge University Press, 2012.
3. S. J. Russell, P. Norvig. Artificial Intelligence: A Modern Approach. Third Edition, Prentice-Hall, 2010.

WEBSITES

1. www.programmingsimplified.com
2. [www.programiz.com / cpp -programming](http://www.programiz.com/cpp-programming)
3. <https://machinelearningmastery.com/>

SEMESTER-VI

ELECTIVE MINOR

6H-4C

Instruction Hours/week: L:6 T:0 P:0

Marks: Internal:40 External:60 Total:100

BACHELOR OF COMPUTER APPLICATIONS
24CAU691

2024-2025

SEMESTER-VI

PROJECT

8H-6C

Instruction Hours/week: L:0 T:0 P:8

Marks: Internal:40 External:60 Total:100

SEMESTER-VII

ARTIFICIAL INTELLIGENCE

6H-6C

Instruction Hours/week: L:6 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To understand the Concepts of Artificial Intelligence
- To learn the different problem-solving techniques in AI
- To learn to represent knowledge in solving AI problems
- To understand the different ways of designing software agents
- To know about the various applications of AI.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Understand the Basic concepts of Artificial Intelligence.	Remember, Understand
CO2	Represent a problem using first order and predicate logic.	Apply
CO3	Provide the apt agent strategy to solve a given problem.	Understand
CO4	Design software agents to solve a problem.	Apply
CO5	Analyze the various applications that use AI technology.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S		S		S										
CO2	S		S	S											
CO3	S		M	M											
CO4	S			M		M									
CO5	S				M										

S-Strong; M-Medium; L-Low

UNIT I **14 Hours**

Introduction to Artificial Intelligence: Definition- History, Types - Future of Artificial Intelligence-Agent in Artificial Intelligence-Intelligent agents– Characteristics of Intelligent Agents– Types of Intelligent Agents –Example of Agents with their PEAS representation-CASE STUDY- Problem Solving Approach to Typical AI problem (Water Jug problem)-Towers of HANOI Problem

UNIT II **14 Hours**

Problem solving Methods: Search Strategies- Uninformed - Informed - Heuristics - Local Search Algorithms and Optimization Problems - Backtracking Search - Game Playing – Alpha - Beta Pruning - Stochastic Games -CASE STUDY- Traveling Salesman Problem

UNIT III **14 Hours**

KNOWLEDGE REPRESENTATION: First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining Backward Chaining – Resolution – Knowledge Representation - Categories and Objects – Events - Reasoning Systems for Categories - Reasoning with Default Information

UNIT IV **15 Hours**

SOFTWARE AGENTS: Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems.

UNIT V **15 Hours**

APPLICATIONS: AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing - Machine Translation – Speech Recognition – Robot – Hardware – Perception.

Suggested Readings

- 1 Deepak Khemani 2015. “Artificial Intelligence”, Tata Mc Graw Hill Education
- 2 Stuart Russel and Peter Norvig 2016. “AI – A Modern Approach”, 2nd Edition, Pearson Education.
- 3 Peter Jackson, 2016. “Introduction to Expert Systems”, 3rd Edition, Pearson Education.
- 4 Dan W. Patterson, 2017. “Introduction to AI and ES”, Pearson Education.
- 5 Kevin Knight and Elaine Rich, Nair B.,2018. “Artificial Intelligence (SIE)”, Mc Graw Hill.

Websites

- 1 <https://www.simplilearn.com/tutorials/artificial-intelligence-tutorial>
- 2 <https://pdf.co/blog/problem-solving-techniques-in-artificial-intelligence-ai>
- 3 <https://stacks.stanford.edu/file/druid:xw061vq8842/xw061vq8842.pdf>
- 4 <https://www.edureka.co/blog/knowledge-representation-in-ai/>
- 5 https://en.wikipedia.org/wiki/Software_agent

SEMESTER-VII

TEXT ANALYTICS

6H-6C

Instruction Hours/week: L:6 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To interpret the basics of text analysis.
- To infer about text mining - text analytics and web analytics.
- To illustrate the domains that makeup text analytics and web analytics.
- To explore text visualization techniques and anomaly detection.
- To learn about Events and trends in text streams

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Recognize the feasibility of History of Text Mining and Basics of Text Analytics	Apply
CO2	Analyze Seven Practice Areas of Text Analytics	Apply
CO3	Design classification techniques for text mining	Understand
CO4	Evaluate effectively use of Web Analytics and Web Mining and Future of Text and Web Analytics	Apply
CO5	Perform Event operations in Text streams	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S														
CO2	S				M										
CO3	S			S											
CO4	S				M										
CO5	S			M											

S-Strong; M-Medium; L-Low

UNIT I Introduction **14 Hours**

History of Text Mining Roots of text mining - Information extraction and text mining - Development of enabling technology in text mining - Sentiment analysis and opinion mining.

Unit – II Text Analytics **14 Hours**

Basics of Text Analytics 6: Definition - Business challenges addressed: information organization and access - Discovery of patterns – Discovery.

UNIT III Areas of Text Analytics **14 Hours**

Seven Practice Areas of Text Analytics : Seven practice areas of text analytics - Finding the appropriate solution to a problem - Overall relationship - Visualizing the domains of text analytics.

UNIT IV Web Analytics and Web Mining **15 Hours**

Web Analytics and Web Mining : Value of web analytics - Components of web mining - Concepts and terminology in web analytics - Web analytics and web mining - Optimal paths to successful web analytics evolution in a company.

UNIT V Future of web analytics **15 Hours**

Future of Text and Web Analytics: Text analytics and text mining - Future of web analytics - Future of text mining - Integration of web analytics with standard business intelligence tools – New areas that may use text analytics. Case Studies

Suggested Readings

- 1 Michael W. Berry & Jacob Kogan, "Text Mining Applications and Theory", Wiley publications, 2010.
- 2 Aggarwal, Charu C., and Cheng Xiang Zhai, eds., "Mining text data", Springer Science & Business Media, 2020.
- 3 Miner, Gary, et al., "Practical text mining and statistical analysis for non-structured text data applications", Academic Press, 2012.
- 4 Srivastava, Ashok N., and Mehran Sahami, "Text mining: Classification, clustering, and applications", Chapman and Hall/CRC, 2022.
- 5 Buitelaar, Paul, Philipp Cimiano, and Bernardo Magnini, eds., "Ontology learning from text: methods, evaluation and applications", Vol. 123. IOS press, 2019.

Websites

- 1 https://en.wikipedia.org/wiki/Text_mining
- 2 <https://guides.lib.berkeley.edu/text-mining>
- 3 <https://nptel.ac.in/courses/110107129>
- 4 <https://www.oreilly.com/library/view/text-mining-and/9781612907871/>

SEMESTER-VII
STATISTICAL COMPUTING

6H-5C

Instruction Hours/week: L:6T:0 P:0**Marks: Internal:40 External:60 Total:100****End Semester Exam:3 Hours****Course Objectives**

- To develop the statistical skills in the areas of sampling and test of hypothesis.
- To understand statistical techniques as powerful tool in scientific computing.
- To enable the students to gain knowledge about test for randomness and run test.
- To make the students to understand the concept of sign test and Wilcoxon Signed rank test.
- To learn chi-square test for independence as well as to understand the concept of quality, process and product control using control chart techniques and sampling inspection plan.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	To understand the principles of census and sample surveys and to become competent for conducting sample surveys.	Understand
CO2	To find information about the population on the basis of a random sample taken from that population and also to choose an appropriate test procedure under the test of significance	Apply
CO3	To know the difference between parametric and non-parametric tests.	Apply
CO4	To learn and understand the difference between one way and two-way ANOVA.	Apply
CO5	To know about the basic of Statistical Quality Control and its tools	Understand, Apply, Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S					L									
CO2	S			M											
CO3	S														
CO4	S				M										
CO5	S				M										

S-Strong; M-Medium; L-Low

UNIT I

14 Hours

Sample Survey Basic Concept of Sample Survey - Census and Sample Survey - Population and Sample – Parameter and Statistic – Preparation of Questionnaire and Schedules – Principle steps in Sample Survey – Pilot survey – Sampling Distribution - Standard Error - Sampling and Non-sampling Errors – Advantages over Complete Enumeration – Limitations of Sampling.

Unit – II

14 Hours

Test of Significance Sampling Distribution - Standard Error – Test of Hypothesis: Simple Hypothesis, Null Hypothesis and Alternative Hypothesis – Test of Significance: Large Sample Test based on Mean, Differences of Means, Proportion and Difference of Proportions - Small Sample Test based on Mean, Difference of Means, Paired ‘t’ Test.

UNIT III

15 Hours

Analysis of Variance F-test – Analysis of Variance (ANOVA) – Test procedure for One way and Two way classifications – Simple Problems.

UNIT IV

15 Hours

Introduction of Non-parametric Test – Difference between Non-parametric and Parametric Test – Advantage and Limitations of Non-parametric Tests – Comparison of One and Two Populations Test for Randomness – Run Test – Test for Rank Correlation Coefficient – Sign Test. Comparison of Two Populations Median Test – Mann Whitney U Test.

UNIT V

15 Hours

Meaning and Concepts of Quality – Quality of Design – Standardization for Quality – Quality Movement – Quality Management – Quality of Conformance – Need for Statistical Quality Control Techniques in Industry – Causes of Quality Variations – Process Control and Product Control – Statistical basis for Control Charts – Uses of Shewart’s Control Charts - R Charts - Charts for Defectives p and np Charts.

Suggested Readings

- 1 Gupta S. P., (2001), Statistical Methods, Sultan Chand & Sons, New Delhi.
- 2 Gupta S. C., (1974), Statistical Quality Control, Khanna Publishing Co, New Delhi.
- 3 Mahajan M., (2009), Statistical Quality Control, Dhanpat Rai & Co. (P) Ltd., Educational & Technical Publishers, New Delhi.

Websites

- 1 <http://www2.ing.unipi.it/lanzetta/stat/Chapter20.pdf>
- 2 <https://www.statisticshowto.com/parametric-and-non-parametric-data/>
- 3 <http://onlinestatbook.com/2/introduction/inferential.html>

SEMESTER-VII

ARTIFICIAL INTELLIGENCE PRACTICAL

6H-3C

Instruction Hours/week: L:0 T:0 P:6

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To impart the basic knowledge about the fundamentals of Artificial intelligence.
- To understand the concepts of Algorithms for Artificial intelligence.
- To understand the working of Semiconductor devices and Digital Circuits.
- To impart the basic knowledge of Measuring Instruments and Electrical Installation.
- Know the Principles of pattern recognition with estimation.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	To Understand the concept of Artificial intelligence.	Understand, Apply
CO2	To apply various search algorithms of artificial intelligence.	Understand, Apply
CO3	To apply knowledge representation and reasoning techniques	Apply
CO4	To understand & apply different types of machine learning and models.	Apply
CO5	To understand the design principles of pattern recognition with estimation and apply classification technique	Create

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S								L						
CO2	S			M					L						
CO3	S			M	M				L						
CO4	S			M					L						
CO5	S			M	M				L						

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS

72 Hours

- 1 Write a Program to Implement Breadth First Search using Python.
- 2 Write a Program to Implement Depth First Search using Python
- 3 Write a Program to Implement Tic-Tac-Toe game using Python.
- 4 Write a Program to Implement 8-Puzzle problem using Python
- 5 Write a Program to Implement Water-Jug problem using Python
- 6 Write a Program to Implement Travelling Salesman Problem using Python
- 7 Write a Program to Implement Tower of Hanoi using Python.
- 8 Write a Program to Implement Monkey Banana Problem using Python.
- 9 Write a Program to Implement 4 Queen Problem.
- 10 Write a Program to Implement a simple chatbot.

Suggested Readings

- 1 Artificial Intelligence by Elaine Rich, Kevin Knight and Nair ISBN-978-0-07- 008770-5, TMH,
- 2 Artificial Intelligence by SarojKausik ISBN:- 978-81-315-1099-5, Cengage Learning
- 3 Artificial Intelligence and Intelligent Systems by Padhy, Oxford University Press,
- 4 Artificial Intelligence: A Modern Approach by Peter and Norvig ISBN-0-13- 1038052

Websites

- 1 <https://www.udemy.com/course/road-map-to-artificial-intelligence-and-machine-learning>
- 2 <https://ai.google/education/>
- 3 <https://www.iiitd.ac.in/iiit-delhi-pgdcsai/>
- 4 <https://www.marketingainstitute.com/blog/3-free-online-artificial-intelligence-courses-taught-by-google-and-stanford-experts>
- 5 <https://www.mygreatlearning.com/ai/free-courses>
- 6 <https://www.classcentral.com/subject/ai>
- 7 <https://dlabs.ai/blog/top-10-free-machine-learning-and-artificial-intelligence-courses/>

SEMESTER-VII
TEXT ANALYTICS PRACTICAL

6H-3C

Instruction Hours/week: L:0 T:0 P:6

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- Explain the text analytics framework.
- Analyze various sources of text data.
- Measure machine learning model performance with appropriate metrics.
- Interpret the results, gain insights, and recommend possible actions from analytics performed on text data.
- Implement the text analytics learning concepts in any suitable language of choice

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Apply structured thinking to unstructured problems	Apply
CO2	Analyze various sources of text data.	Analyze
CO3	Understand the mathematical and statistical prospective of machine learning algorithms through python programming	Understand
CO4	Create processes and implement apply various reinforcement algorithms to solve real time complex problems.	Analyze
CO5	Develop an appreciation for what is involved in learning from data	Develop

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S		S						L						
CO2	S				M				L						
CO3	S				M				L						
CO4	S			M					L					L	
CO5	S								L						L

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS

72 Hours

1. To Implement Perform Text –Wrangling and pre-processing textual data using python
2. Calculate number of words, number of characters, average word length and number of stop words
3. Remove the words using Tokenization (Stop words removal, punctuations ,etc.,) for text data.
4. Calculate N-grams and term frequency for multiple words in the dataset
5. Calculate Inverse Document Frequency and Term Frequency –Inverse Document Frequency (TF-IDF) for words
6. Perform sentiment analysis of few tweets in python
7. Convert the text into vectors using words embedding techniques
8. Write code that groups document by topic
9. Solve using supervised model for text data
10. Solve using the unsupervised model for text data
11. Write a program using any algorithm to retrieve documents.
12. To Implementing two different map reduce programs using joins

SUGGESTED READINGS

1. Manning, C. D., Raghavan, P., and Schütze, H. 2008. Introduction to Information Retrieval. Cambridge University Press, 2008.
2. Miner, G., Delen, D., Elder, J., Fast, A., Hill, T., and Nisbet, A. R. (2012). Practical Text Mining and Statistical Analysis for Non-structured Text Data Applications. Elsevier Inc..
3. Bird, S., Klein, E., & Loper, E. (2009). Natural Language Processing with Python. O'Reilly Media, Inc.

4. Abdul-Mageed, M. (2016). Sentiment Analysis.
5. Armony, J., & Vuilleumier, P. (Eds.). (2013). The Cambridge handbook of human affective neuroscience. Cambridge University Press.

WEBSITES

1. <http://www-nlp.stanford.edu/IRbook/>.
2. <http://www.gbv.de/dms/ilmenu/toc/668584769.PDF>
3. <https://guides.lib.berkeley.edu/text-mining>
4. https://en.wikipedia.org/wiki/Text_mining

SEMESTER- VIII-A
DATA VISUALIZATION

6H-4C

Instruction Hours/week: L:6 T:0 P:0**Marks: Internal:40 External:60 Total:100****End Semester Exam:3 Hours****Course Objectives**

- To impart the basic knowledge about the Data Visualization techniques.
- To understand the concept of Recent Trends in Data Visualization Techniques.
- To understand the working of various data analysis tasks.
- To impart the basic knowledge of data set in visualization.
- Know the fundamentals of design issues in visual perception.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Explore various data visualization techniques in order to provide new insight.	Remember
CO2	Apply appropriate data visualization techniques to provide trends/insights for the given dataset.	Understand
CO3	Apply visualization tools / techniques for various data analysis tasks.	Apply
CO4	Given the application context for given data set, Design the information Dashboard for access information based on user criteria.	Analyze
CO5	Evaluate the design issues, assessment of needs, critical design practices.	Evaluate

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S				M										
CO2	S			M											
CO3	S			M											
CO4	S						L							L	
CO5	S		M		M										

S-Strong; M-Medium; L-Low

UNIT I

12 Hours

Introduction to Data Visualization: Acquiring and Visualizing Data, Simultaneous acquisition and visualization, Applications of Data Visualization, Keys factors of Data Visualization (Control of Presentation, Faster and Better JavaScript processing, Rise of HTML5, Lowering the implementation Bar) Exploring the Visual Data Spectrum: charting Primitives (Data Points, Line Charts, Bar Charts, Pie Charts, Area Charts), Exploring advanced Visualizations (Candlestick Charts, Bubble Charts, Surface Charts, Map Charts, Infographics). Making use of HTML5 CANVAS, Integrating SVG.

UNIT II

12 Hours

Basics of Data Visualization – Tables: Reading Data from Standard text files (.txt, .csv, XML), Displaying JSON content Outputting Basic Table Data (Building a table, Using Semantic Table, Configuring the columns), Assuring Maximum readability (Styling your table, Increasing readability, Adding dynamic Highlighting), Including computations, Using data tables library, relating data table to a chart.

UNIT III

12 Hours

Visualizing data Programmatically: Creating HTML5 CANVAS Charts (HTML5 Canvas basics, Linear interpolations, A Simple Column Chart, Animations), Starting with Google charts (Google Charts API Basics, A Basic bar chart, A basic Pie chart, Working with Chart Animations).

UNIT IV

12 Hours

Introduction to D3.js: Getting setup with D3, Making selections, changing selection's attribute, Loading and filtering External data : Building a graphic that uses all of the population distribution data, Data formats you can use with D3, Creating a server to upload your data, D3's function for loading data, Dealing with Asynchronous requests, Loading and formatting Large Data Sets.

UNIT V

12 Hours

Advanced Data Visualization: Making charts interactive and Animated: Data joins, updates and exits, interactive buttons, Updating charts, Adding transactions, using keys Adding a Play Button: wrapping the update phase in a function, Adding a Play button to the page, Making the Play button go, Allow the user to interrupt the play, sequence.

Suggested Readings

- 1 Jon Raasch, Graham Murray, Vadim Ogievetsky, Joseph Lowery, “JavaScript and jQuery for Data Analysis and Visualization”, WROX
- 2 Ritchie S. King, Visual story telling with D3” Pearson
- 3 Ben Fry, "Visualizing data: Exploring and explaining data with the processing environment", O'Reilly, 2008.
- 4 Tamara Munzner, Visualization Analysis and Design, AK Peters Visualization Series, CRC Press, Nov. 2014

Websites

- 1 <https://www.tableau.com/learn/articles/data-visualization>
- 2 <https://www.ibm.com/in-en/topics/data-visualization>
- 3 <https://www.geeksforgeeks.org/data-visualization-with-python/>

SEMESTER-VIII-A

ADVANCED JAVA

6H-4C

Instruction Hours/week: L:6 T:0 P:0**Marks: Internal:40 External:60 Total:100****End Semester Exam:3 Hours****Course Objectives**

- To understand the Graphical User Interface (GUI) networking, and database manipulation.
- To know the use of advanced technology in Java such as Internationalization, and Remote method Invocation
- To learn how to work with JavaBeans.
- To develop web application using Java Servlet and Java Server Pages technology.
- To know the architecture of JSP and JSTL.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Identify advance concepts of java programming with database connectivity	Apply
CO2	java.net package contains the fundamental classes for communications and working with networked resources.	Apply
CO3	Design and develop platform independent applications using a variety of component based frameworks	Understand
CO4	Make familiar with Java Servlet concepts by working on projects related to java Servlet.	Apply
CO5	Support for common structural tasks such as iteration and conditional tags for manipulating tags.	Evaluate

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S			M											
CO2	S														
CO3	S			M							L				
CO4	S														
CO5	S														

S-Strong; M-Medium; L-Low

UNIT I

12 Hours

SWING AND DATABASE CONNECTIVITY : Introduction To Swing, MVC Architecture, Applets, Applications and Pluggable Look and Feel, Basic swing components : Text Fields, Buttons, Toggle Buttons, Checkboxes, and Radio Buttons. Java database Programming, java.sql Package, JDBC driver.

UNIT II

12 Hours

NETWORKING, RMI PROGRAMMING, SERIALIZATION AND INTERNATIONALIZATION Network Programming With java.net Package, Client and Server Programs, Content And Protocol Handlers. RMI architecture, RMI registry, Writing distributed application with RMI, Naming services, Naming And Directory Services, Overview of JNDI, Object serialization and Internationalization.

UNIT III

12 Hours

J2EE ARCHITECTURE: J2EE architecture, Enterprise application concepts, n-tier application concepts, J2EE platform, HTTP protocol, web application, Web containers and Application servers

UNIT IV

12 Hours

SERVLET PROGRAMMING: Server side programming with Java Servlet, HTTP and Servlet, Servlet API, life cycle, configuration and context, Request and Response objects, Session handling and event handling, Introduction to filters with writing simple filter application

UNIT V

12 Hours

JSP & JSTL: JSP architecture, JSP page life cycle, JSP elements, Expression Language, Tag Extensions, Tag Extension API, Tag handlers, JSP Fragments, Tag Files, JSTL, Core Tag library, overview of XML Tag library, SQL Tag library and Functions Tag library.

Suggested Readings

- 1 Java 6 Programming, Black Book, Dreamtech
- 2 Java RMI, William Grosso Publisher: O' Reily, Giant Dino
- 3 The Complete Reference,J2EE, Jim Keogh
- 4 Java Server Programming, Java EE6 (J2EE 1.6), Black Book, Dreamtech
- 5 Advanced Java Technology, By M.T. Savaliya, Dreamtech

Websites

- 1 <https://www.javaguides.net/2019/07/java-swing-application-with-database-connection.html>
- 2 https://www.tutorialspoint.com/java_rmi/java_rmi_introduction.htm
- 3 https://www.ibm.com/docs/SS4JE2_7.5.5/org.eclipse.jst.j2ee.doc.user/topics/cjarch.html
- 4 <https://www.javatpoint.com/servlet-tutorial>
- 5 <https://www.javatpoint.com/jstl>

SEMESTER-VIII-A
ORGANIZATIONAL BEHAVIOR

6H-3C

Instruction Hours/week: L:6 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To understand the basic concepts of organizational behavior.
- To analyze the individual behavior traits required for performing as an individual or group.
- To obtain the perceiving skills to judge the situation and communicate the thoughts and ideas.
- To 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.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Relate the different personality types and attitudes	Understand
CO2	Describe various causes of perception, emotions and moods to shape and modify behavior.	Understand
CO3	Discuss the various theories of motivation and apply them to create effective team	Understand
CO4	Compare and contrast various leadership theories and styles	Understand
CO5	Apply various methods for conflict management	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S	M			M		M		M		M	S	S		
CO2	S	M	S		S				L						
CO3	S	S	M		M		S		L					S	
CO4	S		M		M									M	L
CO5	S		M	M			S							M	L

S-Strong; M-Medium; L-Low

UNIT I

12 Hours

OB: Meaning and Importance - Disciplines Contributing to Organizational Behaviour - Challenges and opportunities for OB. Personality: Its determinants, attributes, traits - Values & attitudes. Perception: Factors Influencing – Link between Perception and Individual Decision making

UNIT II

12 Hours

Motivation: Motivation - Basic Concepts-Motivation Theories. Group Dynamics and Team Management -Types of Groups, Group Norms and Cohesiveness: Group Roles,– Group Decision making Techniques teams, creating effective team.

UNIT III

12 Hours

Organizational Culture: Role, Elements of Organizational Culture-Organizational Culture and Performance-Changing and Strengthening Culture-Organizational Socialization-matching people with culture

UNIT IV

12 Hours

Conflict Process: Sources of Conflict-Structural approach to Conflict Management-Resolving conflict through Negotiation. Organizational Dynamics: Organizational Change- Forces for change, managing resistance to change - Organization Development

UNIT V

12 Hours

Organizational Theories: Theories of Learning - Behaviour modification. Contingent Workforce Power and Politics in Organization – Leadership and Communication. Stress: Work Stress-Cause and Consequences-Stress Management.

Suggested Readings

- 1 Robbins Stephen. P, “Organizational Behaviour”, Pearson Education, 2013.
- 2 Mcshane L. Steven, Von Glinow Mary, and Ann Sharma R. Radha, “Organizational Behaviour”,Tata McGraw Hill, 2012.
- 3 Luthans Fred, “Organizational Behaviour”, Tata McGraw Hill, 2013.
- 4 Dash Chandra Sekhar, “Organizational Behaviour”, International Book House, 2013.
- 5 Kumar Meenakshi, “Organizational Behaviour”, Vikas Publication, 2012.

Websites

- 1 <https://libguides.tru.ca/organizationalbehaviour/>
- 2 <https://openstax.org/details/books/organizational-behavior>

BACHELOR OF COMPUTER APPLICATIONS**2024-2025****24CAU811****SEMESTER- VIII-A****DATA VISUALIZATION - PRACTICAL****6H-4C****Instruction Hours/week: L:0 T:0 P:6****Marks: Internal:40 External:60 Total:100****End Semester Exam:3 Hours****Course Objectives**

- To interpret data plots and understand core data visualization concepts such as correlation, linear relationships, and log scales.
- To explore the relationship between two continuous variables using scatter plots and line plots.
- To translate and present data and data correlations in a simple way, data analysts use a wide range of techniques — charts, diagrams, maps, etc

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Design effective data visualizations in order to provide new insights into a research question or communicate information to the viewer	Apply
CO2	Find and select appropriate data that can be used in order to create a visualization that answers a particular research question.	Apply
CO3	Properly document and organize data and visualizations in order to prepare them for reuse.	Understand
CO4	Given the application context for given data set, Design the information Dashboard for access information based on user criteria.	Apply
CO5	Evaluate the design issues, assessment of needs, critical design practices.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S	M	S		S				L						
CO2	S	M	S	S		L		L	L	M					
CO3	S		M	M					L						
CO4	S			M		M			L						
CO5	S				M				L						

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS

60

Hours

1. Loading and Distinguishing Dependent and Independent parameters
2. Exploring Data Visualization tools
3. Drawing Charts
4. Drawing Graphs
5. Data mapping
6. Creating Scatter Plot maps
7. Using BNF Notations
8. Working with REGEX
9. Visualize Network Data
10. Understanding Data Visualization frameworks

Suggested Readings

1. E. Tufte, The Visual Display of Quantitative Information, Graphics Press. 2nd Edition, 2001
2. Alexandru C Telea, Data Visualization: Principles And Practice, 2nd Edition, 2014
3. Wang Kaining, Infographic & Data Visualizations, sew Edition. 2013
4. Andy Krik, Data Visualisation : A Handbook for Data Driven Design, 1st Edition, 2016

Websites

1. <https://www.tableau.com/learn/articles/data-visualization>
2. <https://www.ibm.com/in-en/topics/data-visualization>
3. <https://www.geeksforgeeks.org/data-visualization-with-python/>
4. <https://www.freecodecamp.org/news/d3js-tutorial-data-visualization-for-beginners/>
5. <https://www.dataversity.net/demystifying-advanced-data-visualization/>

SEMESTER-VIII

ADVANCED JAVA - PRACTICAL

6H-4C

Instruction Hours/week: L:6 T:0 P:0

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

- To understand the Graphical User Interface (GUI) networking, and database manipulation.
- To know the use of advanced technology in Java such as Internationalization, and Remote method Invocation
- To learn how to work with JavaBeans.
- To develop web application using Java Servlet and Java Server Pages technology.
- To know the architecture of JSP and JSTL.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Identify advance concepts of java programming with database connectivity	Apply
CO2	java.net package contains the fundamental classes for communications and working with networked resources.	Apply
CO3	Design and develop platform independent applications using a variety of component based frameworks	Understand
CO4	Make familiar with Java Servlet concepts by working on projects related to java Servlet.	Apply
CO5	Support for common structural tasks such as iteration and conditional tags for manipulating tags.	Evaluate

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S		S		S	L			L	L					
CO2	S		S	S				L	L	L					
CO3	S		M	M				L	L	L					
CO4	S			M		M			L	L					
CO5	S				M				L	L					

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS

60

Hours

1. Write a program to access a table Product Master from MySQL4.1 database using Java code.
2. Write a program using Servlet to display Visitor Count.
3. Write a program for authentication, which validate the login-id and password by the servlet code.
4. Write a program to connecting a database using user-id and password.
5. Write a program to insert data into the database using the prepared statement.
6. Write a program to read data from the database using the ResultSet.
7. Write a program to read data send by the client (HTML page) using servlet.
8. Write a program to include a HTML page into a JSP page.
9. Write a program to display http request Header in JSP.
10. Write a program to handle the JSP Exception.
11. Write a program to read data send by a client (HTML page) using JSP.
12. Write a program to Develop Login Form in Struts.

Suggested Readings

- 1 Java 6 Programming, Black Book, Dreamtech
- 2 Java RMI, William Grosso Publisher: O' Reily, Giant Dino
- 3 The Complete Reference,J2EE, Jim Keogh
- 4 Java Server Programming, Java EE6 (J2EE 1.6), Black Book, Dreamtech
- 5 Advanced Java Technology, By M.T. Savaliya, Dreamtech

Websites

- 1 <https://www.javaguides.net/2019/07/java-swing-application-with-database-connection.html>
- 2 https://www.tutorialspoint.com/java_rmi/java_rmi_introduction.htm
- 3 https://www.ibm.com/docs/SS4JE2_7.5.5/org.eclipse.jst.j2ee.doc.user/topics/cjarch.html
- 4 <https://www.javatpoint.com/servlet-tutorial>
- 5 <https://www.javatpoint.com/jstl>

SEMESTER- VIII B
RESEARCH METHODOLOGY AND IPR

6H-4C

Instruction Hours/week: L:6 T:0 P:0**Marks: Internal:40 External:60 Total:100****End Semester Exam:3 Hours****Course Objectives**

- To understand the methods and techniques in Research Methodology.
- To study the various methods available for Data Collection
- To understand the importance of Intellectual Property Rights
- To impart the knowledge of filing and publishing patents.
- To know the fundamentals of copyrights for protecting innovations.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Analyze the importance of Research Methodology	Analyze
CO2	Apply the Data Collection methods for doing Research	Apply
CO3	Analyze the role of Intellectual Property Rights for protecting the Intellectual Products	Analyze
CO4	Apply the methods of filing patents for protecting inventions of Individuals	Apply
CO5	Apply the procedure of copyrights for maintaining ownership	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S		S	M	S	L				L					
CO2	S		S	S	L	L				L					
CO3	S		M	M				L		L					
CO4	S			M		M		L		L					
CO5	S				M			L		L			M		

S-Strong; M-Medium; L-Low

UNIT I RESEARCH FORMULATION AND DESIGN

12 Hours

Nature and Scope of Research in Business- Types of Research - Significance - Research Process- Characteristics of Good Research-Problem Identification and Selection – Review of Literature – Need for review of Literature - Research Design - Meaning, Need, Features of Good Design - Different types of Research Design - Developing a Research Plan -Hypothesis-Meaning-Significance-Testing-Types-Type I/ II Errors. Report Writing - Layout of the report -Analysis and Interpretation - Types of report - Steps in writing the report - Evaluation of report

UNIT II DATA COLLECTION AND ANALYSIS

12 Hours

Accepts of method validation, observation and collection of data - methods of data collection, sampling methods - Data processing and Analysis strategies and tools- Data analysis with statically package (Sigma STAT,SPSS for student t-test, ANOVA, etc.) - Hypothesis testing

UNIT III Overview of IPR

12 Hours

Introduction to Intellectual Property Rights - Concept and Theories - Kinds of Intellectual Property Rights - Economic analysis of Intellectual Property Rights - Need for Private Rights versus Public Interests- Advantages and Disadvantages of IPR.

UNIT IV Patents

12 Hours

Definition, kind of inventions protected by patent- Patentable and Non patentable inventions- Process and product patent - patent of addition - Legal requirements for patents- Granting of patent - Rights of a patent - Exclusive Rights. Patent Application Process: Searching a patent – Drafting of a patent- Filing of a patent- Types of patent Applications

Unit V Copyrights

12 Hours

Copyrights- Rights and Protection covered by copyright – Law of copy rights: Fundamentals of copyright law- originality of material- rights of reproduction – Rights to perform the work publicly- Copyright Ownership Issues-Obtaining Copyright Registration -Notice of Copyright – International Copyright Law- Infringement of Copyright Under Copyright Act

Suggested Readings

- 1 R.Radha Krishnan and S.Balasubramanian, “Intellectual Property Rights” , First Edition, Excel Books, New Delhi, 2012
- 2 Mr.Ramakrishna Chintakunta, “A Textbook of Intellectual Property Rights”, Blue Hill Publications,2022.
- 3 Voldman, Steven H, “From Invention to Patent: Scientist and Engineer’s Guide”, Wiley Publications,2018
- 4 C.R. Kothari , Gaurav Garg , Research Methodology Methods and Techniques, New Age International Publishers, 2019

Websites

- 1 <https://research.com/research/how-to-write-research-methodology>
- 2 <https://blog.ipleaders.in/all-about-intellectual-property-rights-ipr/>
- 3 <https://www.enago.com/academy/researchers-guide-to-patents/>
- 4 <https://www.studocu.com/en-gb/document/university-of-kent/intellectual-property-law/copyright-notes/4708386>

SEMESTER- VIII B
SPSS - PRACTICAL

6H-3C

Instruction Hours/week: L:0 T:0 P:6

Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

Course Objectives

This course enables the students to learn

- To understand the basic concepts in probability the or and the nature of uncertainty.
- To realize the applications of probability and commonly used probability distributions (both discrete and continuous), Central Limit theorem and their applications in various disciplines.
- To know the various techniques of descriptive and inferential statistics, and how to apply them for examining data in the analytical decision making.
- To draw conclusions based on sample data by constructing statistical hypothesis and estimation with statistical tools and techniques.
- To explain the foundations of probabilistic and statistical analysis which are mostly applied in computer science.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Evaluate various measures of descriptive statistical measures for any given data.	Analyze
CO2	Comprehend the application of Bivariate and multivariate analysis	Apply
CO3	Understand the basic concept of test of significance and make inferences from statistical tests	Understand
CO4	Derive the relationship between data using Correlation, Rank Correlation and Regression for two variables.	Apply
CO5	Develop an ability to analyze, demonstrate to provide meaningful information in from the collected statistical data.	Evaluate

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15
CO1	S		M	M	M				L						
CO2	S		L	L	L				L						
CO3	S		M	M	M				L						
CO4	S		M	L	L				L						
CO5	S		M	M	M				L						

List of Programs

60 Hours

1. Various other Software Package available for Data Analytics
2. Calculation of Basic Statistical Measures using Excel.
3. Introduction to SPSS Software Package for Data Analytics
4. Drawing of graphs and diagrams using SPSS software
5. Calculation of Mean, Median and Mode
6. Calculation of Standard deviation
7. Calculation of Karl Pearson's Correlation
8. Calculation of Rank Correlation Coefficient
9. Fitting of Linear Regression
10. Hypothesis Testing for small sample test (t - test)
11. Hypothesis Testing for two sample t - test
12. Hypothesis Testing for Large sample (Z-test)
13. Testing Hypothesis using chi-square - test (for Goodness of fit)
14. Testing Hypothesis using chi-square - test (for Contingency Table)

Suggested Readings

1. SPSS Lab Manual
2. U Dinesh Kumar (2017), Business Analytics: The Science of Data - Driven Decision Making, Wiley, New Delhi.
3. Daniel Y Chen (2017), Pandas for everyone - Python data Analysis,
4. R. Evans James (2017), Business Analytics, 2nd edition, Pearson Education, New Delhi.

BACHELOR OF COMPUTER APPLICATIONS

2024-2025

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SEMESTER- VIII B

RESEARCH PROJECT / PREPARATION OF RESEARCH PROJECT

18H-12C

Instruction Hours/week: L:0 T:0 P:18

Marks: Internal:100 External:200 Total:300

End Semester Exam:3 Hours

ELECTIVE COURSE SYLLABUS:

1. NATURAL LANGUAGE PROCESSING

UNIT -I : Introduction to NLP

Basics of Natural Language Processing -Linguistic Essentials: Syntax, Semantics, Pragmatics - Applications of NLP-Text Preprocessing: Tokenization, Lemmatization, Stemming, Stop Words.

UNIT 2: Language Modeling and Text Analysis

Statistical Language Models-N-grams and their applications-Text Classification and Clustering- Sentiment Analysis and Opinion Mining

UNIT 3: Parsing and Syntactic Analysis

Part-of-Speech Tagging-Parsing Algorithms: Dependency and Constituency Parsing
Syntax-Driven Translation-Treebanks and Annotated Corpora

UNIT 4: Semantic Analysis and Information Retrieval

Named Entity Recognition (NER) - Word Sense Disambiguation (WSD) -Semantic Role Labeling - Information Retrieval Systems and Search Engines

UNIT 5: Advanced Topics in NLP

Machine Translation - Speech Recognition and Synthesis - Deep Learning for NLP: RNNs, LSTMs, Transformers - Ethical Considerations in NLP.

SUGGESTED READINGS

1. "Speech and Language Processing" by Daniel Jurafsky and James H. Martin (3rd Edition, 2023)
2. "Natural Language Processing with Python" by Steven Bird, Ewan Klein, and Edward Loper (1st Edition, 2009)
3. "Deep Learning for Natural Language Processing" by Palash Goyal, Sumit Pandey, and Karan Jain (1st Edition, 2018)
4. "Foundations of Statistical Natural Language Processing" by Christopher D. Manning and Hinrich Schütze (1st Edition, 1999)
5. "Introduction to Information Retrieval" by Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schütze (1st Edition, 2008)

2. QUANTUM COMPUTING

UNIT 1: Introduction to Quantum Computing

Basic Concepts of Quantum Mechanics - Qubits and Quantum States - Quantum Superposition and Entanglement - Quantum Gates and Circuits

UNIT 2: Quantum Algorithms

Quantum Parallelism - Deutsch-Josza Algorithm - Grover's Search Algorithm - Shor's Algorithm for Factoring

UNIT 3: Quantum Error Correction

Quantum Noise and Decoherence - Error Correction Codes - Fault-Tolerant Quantum Computing - Physical Realizations of Quantum Computers

UNIT 4: Quantum Cryptography and Communication

Principles of Quantum Cryptography - Quantum Key Distribution (QKD) - Quantum Teleportation - Quantum Networks and Protocols

UNIT 5: Advanced Topics in Quantum Computing

Quantum Machine Learning - Quantum Computing Applications - Current Challenges and Future Directions - Ethical and Practical Implications

SUGGESTED READINGS

1. "Quantum Computation and Quantum Information" by Michael A. Nielsen and Isaac L. Chuang (10th Anniversary Edition, 2010)
2. "Quantum Computing: A Gentle Introduction" by Eleanor Rieffel and Wolfgang Polak (1st Edition, 2011)
3. "An Introduction to Quantum Computing" by Phillip Kaye, Raymond Laflamme, and Michele Mosca (1st Edition, 2006)
4. "Quantum Computing for Computer Scientists" by Noson S. Yanofsky and Mirco A. Mannucci (1st Edition, 2008)
5. "Quantum Computing: An Applied Approach" by Jack D. Hidary (1st Edition, 2019)

3. AUGMENTED REALITY (AR) AND VIRTUAL REALITY (VR)

UNIT 1: Introduction to AR and VR

Definition and History of AR and VR - Basic Concepts and Technologies - Applications and Use Cases - Hardware and Software for AR and VR

UNIT 2: AR and VR Development Tools

Overview of Development Platforms: Unity, Unreal Engine - Creating 3D Models and Environments - Scripting and Interaction Design - Augmented Reality Markers and Tracking

UNIT 3: User Experience and Interaction Design

Human Perception and AR/VR - Designing User Interfaces for AR and VR - Navigation and Interaction Techniques - Usability and User Experience Testing

UNIT 4: Advanced AR and VR Techniques

Sensor Integration and Calibration - Advanced Rendering Techniques - Mixed Reality and Hybrid Systems - Real-Time Data Processing and Analysis

UNIT 5: Future Trends and Challenges

Emerging Trends in AR and VR - Ethical and Social Implications - Case Studies and Industry Applications - Future Research Directions

SUGGESTED READINGS

1. "Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web, and Mobile" by Tony Parisi (1st Edition, 2015)
2. "Augmented Reality: Principles and Practice" by Dieter Schmalstieg and Tobias Hollerer (1st Edition, 2016)
3. "Unity Virtual Reality Projects" by Jonathan Linowes (3rd Edition, 2021)
4. "Prototyping Augmented Reality" by Tony Mullen (1st Edition, 2011)
5. "Virtual Reality" by Steven M. LaValle (1st Edition, 2016).

4. MOBILE APPLICATION DEVELOPMENT

UNIT 1: Introduction to Mobile Development

Overview of Mobile Operating Systems: Android, iOS - Development Environments: Android Studio, Xcode - Mobile App Lifecycle and Architecture - UI/UX Design Principles for Mobile Apps

UNIT 2: Android Application Development

Basics of Java/Kotlin for Android - Layouts, Views, and Resources - Intents, Activities, and Fragments - Data Storage: SQLite, Shared Preferences

UNIT 3: iOS Application Development

Basics of Swift for iOS - Storyboards, XIBs, and Programmatic UI - View Controllers and Navigation - Data Persistence: Core Data, UserDefaults

UNIT 4: Advanced Mobile Development

Networking and API Integration - Location-Based Services - Push Notifications and Background Services - Security and Performance Optimization

UNIT 5: Cross-Platform Mobile Development

Introduction to Cross-Platform Tools: React Native, Flutter - Building and Deploying Cross-Platform Apps - Code Sharing and Platform-Specific Code - Case Studies and Real-World Applications

SUGGESTED READINGS

1. "Android Programming: The Big Nerd Ranch Guide" by Bill Phillips, Chris Stewart, and Kristin Marsicano (4th Edition, 2019)
2. "iOS Programming: The Big Nerd Ranch Guide" by Christian Keur and Aaron Hillegass (7th Edition, 2020)
3. "Flutter Complete Reference" by Alberto Miola (1st Edition, 2022)
4. "Professional Android" by Reto Meier and Ian Lake (4th Edition, 2018)
5. "Learning React Native" by Bonnie Eisenman (2nd Edition, 2017)

5. GAME DEVELOPMENT

UNIT 1: Introduction to Game Development

History and Evolution of Video Games - Game Genres and Platforms - Game Development Pipeline - Overview of Game Engines: Unity, Unreal Engine

UNIT 2: Game Design Principles

Game Mechanics and Dynamics - Storytelling and Narrative Design - Level Design and World Building - Character Design and Animation

UNIT 3: Programming for Games

Basics of Game Programming: C#, C++ - Scripting and Event Handling - Physics and Collision Detection - Artificial Intelligence in Games

UNIT 4: Graphics and Sound

2D and 3D Graphics Rendering - Shaders and Visual Effects - Sound Design and Integration - User Interface Design

UNIT 5: Advanced Game Development

Multiplayer and Networked Games - Virtual Reality and Augmented Reality in Games - Performance Optimization - Game Testing and Debugging

SUGGESTED READINGS

1. "Game Engine Architecture" by Jason Gregory (3rd Edition, 2018)
2. "Introduction to Game Design, Prototyping, and Development" by Jeremy Gibson Bond (2nd Edition, 2017)
3. "Game Programming Patterns" by Robert Nystrom (1st Edition, 2014)
4. "Unity in Action: Multiplatform Game Development in C#" by Joe Hocking (3rd Edition, 2022)
5. "The Art of Game Design: A Book of Lenses" by Jesse Schell (3rd Edition, 2019)

6. DIGITAL FORENSICS

UNIT 1: Introduction to Digital Forensics

Fundamentals of Digital Forensics - Legal and Ethical Considerations - Digital Evidence: Collection and Preservation - Types of Digital Crimes

UNIT 2: Forensic Techniques and Tools

File System Forensics - Network Forensics - Memory Forensics - Mobile Device Forensics

UNIT 3: Forensic Analysis and Reporting

Data Recovery Techniques - Analyzing Logs and Event Data - Report Writing and Presentation - Case Studies and Practical Examples

UNIT 4: Advanced Digital Forensics

Malware Analysis - Cloud Forensics - IoT Forensics - Anti-Forensics Techniques

UNIT 5: Emerging Trends in Digital Forensics

Artificial Intelligence in Forensics - Blockchain and Cryptocurrency Forensics - Legal Developments and Challenges - Future Research Directions

SUGGESTED READINGS

1. "Guide to Computer Forensics and Investigations" by Bill Nelson, Amelia Phillips, and Christopher Steuart (6th Edition, 2018)
2. "Digital Forensics and Incident Response" by Gerard Johansen (2nd Edition, 2020)
3. "Practical Forensic Imaging" by Bruce Nikkel (1st Edition, 2016)
4. "Digital Evidence and Computer Crime" by Eoghan Casey (3rd Edition, 2011)
5. "Malware Forensics: Investigating and Analyzing Malicious Code" by Cameron H. Malin, Eoghan Casey, and James M. Aquilina (1st Edition, 2008)

7. PARALLEL AND DISTRIBUTED COMPUTING

UNIT 1: Introduction to Parallel and Distributed Computing

Overview and History - Parallel Computing Models - Distributed Systems and Architectures - Applications and Use Cases

UNIT 2: Parallel Computing Architectures

Multi-core Processors - GPU Computing - Cluster and Grid Computing - Supercomputing

UNIT 3: Distributed Computing Paradigms

Client-Server and Peer-to-Peer Models - Distributed File Systems - Distributed Databases - Cloud Computing

UNIT 4: Parallel and Distributed Algorithms

Design and Analysis of Parallel Algorithms - Message Passing Interface (MPI) - MapReduce and Hadoop - Load Balancing and Scheduling

UNIT 5: Advanced Topics and Case Studies

Fault Tolerance and Reliability - Security in Distributed Systems - Emerging Technologies: Edge and Fog Computing - Real-World Case Studies and Applications

SUGGESTED READINGS

1. "Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers" by Barry Wilkinson and Michael Allen (2nd Edition, 2005)
2. "Distributed Systems: Principles and Paradigms" by Andrew S. Tanenbaum and Maarten Van Steen (3rd Edition, 2017)
3. "Introduction to Parallel Computing" by Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar (2nd Edition, 2003)
4. "Principles of Distributed Database Systems" by M. Tamer Özsu and Patrick Valduriez (4th Edition, 2020)
5. "High Performance Computing: Modern Systems and Practices" by Thomas Sterling, Matthew Anderson, and Maciej Brodowicz (1st Edition, 2017)

8. DevOps AND CONTINUOUS INTEGRATION

UNIT 1: Introduction to DevOps

DevOps Principles and Practices - Benefits of DevOps - Key Concepts: CI/CD, Infrastructure as Code - DevOps Tools and Technologies

UNIT 2: Continuous Integration (CI)

CI Concepts and Workflows - Setting up a CI Pipeline - Version Control Systems: Git, SVN - Automated Testing and Code Quality

UNIT 3: Continuous Deployment and Delivery (CD)

CD Concepts and Strategies - Deployment Automation Tools: Jenkins, Travis CI - Containerization: Docker and Kubernetes - Monitoring and Logging

UNIT 4: Infrastructure as Code (IaC)

IaC Principles and Tools - Configuration Management: Ansible, Chef, Puppet - Infrastructure Provisioning: Terraform, CloudFormation - Managing Cloud Infrastructure

UNIT 5: Advanced DevOps Practices

DevSecOps: Integrating Security into DevOps - Site Reliability Engineering (SRE) - Scaling and Performance Optimization - Case Studies and Industry Best Practices

SUGGESTED READINGS

1. "The DevOps Handbook: How to Create World-Class Agility, Reliability, & Security in Technology Organizations" by Gene Kim, Jez Humble, Patrick Debois, and John Willis (2nd Edition, 2021)
2. "Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation" by Jez Humble and David Farley (1st Edition, 2010)
3. "Accelerate: The Science of Lean Software and DevOps" by Nicole Forsgren, Jez Humble, and Gene Kim (1st Edition, 2018)
4. "Infrastructure as Code: Managing Servers in the Cloud" by Kief Morris (2nd Edition, 2020)
5. "Effective DevOps: Building a Culture of Collaboration, Affinity, and Tooling at Scale" by Jennifer Davis and Katherine Daniels (1st Edition, 2016)

9. EMBEDDED SYSTEMS

UNIT 1: Introduction to Embedded Systems

Basics of Embedded Systems - Microcontrollers vs. Microprocessors - Embedded System Components - Applications of Embedded Systems

UNIT 2: Hardware and Software Co-design

Embedded Hardware Design - Real-Time Operating Systems (RTOS) - Firmware Development - Embedded Programming Languages: C, C++

UNIT 3: Peripherals and Interfacing

Sensors and Actuators - Communication Protocols: I2C, SPI, UART - ADCs and DACs - Wireless Communication: Bluetooth, Zigbee

UNIT 4: Embedded System Development

Development Tools and IDEs - Debugging and Testing Embedded Systems - Power Management in Embedded Systems - Case Studies and Practical Applications

UNIT 5: Advanced Topics in Embedded Systems

Internet of Things (IoT) - Embedded Security - Embedded Systems in Automotive and Aerospace - Future Trends and Innovations

SUGGESTED READINGS

1. "Embedded Systems: Introduction to the MSP432 Microcontroller" by Jonathan W. Valvano (1st Edition, 2017)
2. "Introduction to Embedded Systems: Using Microcontrollers and the MSP430" by Manuel Jiménez, Rogelio Palomera, and Isidoro Couvertier (2nd Edition, 2016)
3. "Embedded Systems: Real-Time Interfacing to Arm Cortex-M Microcontrollers" by Jonathan W. Valvano (3rd Edition, 2017)
4. "Making Embedded Systems: Design Patterns for Great Software" by Elecia White (1st Edition, 2011)
5. "Embedded System Design: A Unified Hardware/Software Introduction" by Frank Vahid and Tony Givargis (1st Edition, 2001)

10. BIOINFORMATICS

UNIT 1: Introduction to Bioinformatics

Overview of Bioinformatics - Biological Databases and Data Types - Sequence Alignment and Analysis - Genomics and Proteomics

UNIT 2: Computational Biology

Algorithms for Bioinformatics - Phylogenetic Analysis - Structural Bioinformatics - Systems Biology

UNIT 3: Bioinformatics Tools and Techniques

Sequence Analysis Tools: BLAST, FASTA - Genome Annotation Tools - Protein Structure Prediction - Data Visualization Techniques

UNIT 4: Machine Learning in Bioinformatics

Machine Learning Basics - Applications of Machine Learning in Bioinformatics - Predictive Modeling and Data Mining

UNIT 5: Bioinformatics Software and Tools

Popular bioinformatics software: Bioconductor, Biopython, BioPerl - Web-based tools and resources - Case studies and practical applications - Ethical, Legal, and Social Issues: - Data privacy and security in bioinformatics - Ethical considerations in genomics research - Intellectual property and bioinformatics data

SUGGESTED READINGS

1. "Bioinformatics: Sequence and Genome Analysis" by David W. Mount (2nd Edition, 2004)
2. "Bioinformatics: An Introduction" by Jeremy Ramsden (3rd Edition, 2015)
3. "Introduction to Bioinformatics" by Arthur Lesk (5th Edition, 2019)
4. "Biological Sequence Analysis: Probabilistic Models of Proteins and Nucleic Acids" by Richard Durbin, Sean R. Eddy, Anders Krogh, and Graeme Mitchison (1st Edition, 1998)
5. "Essential Bioinformatics" by Jin Xiong (1st Edition, 2006)

11. DIGITAL IMAGE PROCESSING

UNIT 1: Introduction to Digital Image Processing

Fundamentals of Digital Image Processing: Definition and applications - Image acquisition and digitization - Image representation: pixel, resolution, bit depth -Basic Image Operations - Image transforms: Fourier transform, Discrete Cosine Transform (DCT) - Image Quality and Assessment: Noise models and reduction techniques - Image quality metrics: PSNR, SSIM - Image compression: lossless (PNG, GIF) vs. lossy (JPEG)

UNIT 2: Image Processing Techniques

Point Processing Techniques: Intensity transformations: linear, logarithmic, power-law - Histogram processing and equalization - Image subtraction and averaging

Spatial Domain Filtering - Smoothing filters: mean, median, Gaussian - Sharpening filters: Laplacian, high-boost, unsharp masking - Edge detection: Sobel, Prewitt, Canny

UNIT 3: Morphological Image Processing

Fundamentals of Mathematical Morphology: Set theory and binary image processing - Morphological operations - Hit-or-miss transform and boundary extraction - Morphological Algorithms - Applications in image analysis and object recognition

UNIT 4: Image Segmentation and Representation

Image Segmentation Techniques : Thresholding - Region-based segmentation: region growing, region splitting and merging - Edge-based segmentation - Graph-based segmentation methods

UNIT 5: Advanced Topics and Applications

Color Image Processing - Machine Learning in Image Processing: Feature extraction and selection - Supervised and unsupervised learning - Deep learning for image classification and segmentation - Applications of Digital Image Processing.

SUGGESTED READINGS

1. "Digital Image Processing" by Rafael C. Gonzalez and Richard E. Woods (4th Edition, 2018)
2. "Computer Vision: Algorithms and Applications" by Richard Szeliski (2nd Edition, 2022)
3. "Digital Image Processing: An Algorithmic Introduction Using Java" by Wilhelm Burger and Mark J. Burge (2nd Edition, 2016)
4. "Image Processing, Analysis, and Machine Vision" by Milan Sonka, Vaclav Hlavac, and Roger Boyle (4th Edition, 2014)
5. "Fundamentals of Digital Image Processing" by Anil K. Jain (1st Edition, 1989)