KARPAGAM ACADEMY OF HIGHER EDUCATION

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

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.	*Viva – voce* [Comprehensive]*	5
	Total	**40**

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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

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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.	*Viva – voce* [Comprehensive]	10
	Total	**60**

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

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

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.

GPA of a Semester $\frac{\sum_i CiGPi}{\sum_i Ci}$ = 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 = $\frac{\sum_i CiGPi}{\sum_i Ci}$

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

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

where,

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

GPi is the grade point obtained for the course 'i' in any semester

'n' refers to the Semester in which such courses are credited.

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

21. REVALUATION

A candidate can apply for revaluation or re-totaling 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

revaluation and the results will be intimated to the candidate through the HoD concerned**.** Revaluation is not permitted for Supplementary Examinations.

22.TRANSPARENCY AND GRIEVANCE COMMITTEE

Revaluation 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

Karpagam Innovation and Incubation Council (KIIC)

(A Section 8 Company)

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

Norms to Student Start-Ups

a) Any (UG/PG /(Ph.D.) Research scholars, student, right from the first year of their program is allowed to set a startup (or) work part time/ full time in a startup or work as intern in a startup

b) Any (UG/PG / (Ph.D.) Research scholars) student right from the first year of their program is allowed to earn credit for working on Innovative prototypes/business Models/ Pre incubation (case to case basis).

c) Start Up activities will be evaluated based on the guidelines being given by the expert committee of the KIIC

d) Student Entrepreneurs may use the address of incubation center (KIIC) to register their venture while studying in KAHE.

e) Students engaged in startups affiliated with the KIIC or those who work for them may be exempted from KAHE's attendance requirements for academic courses under current regulations, up to a maximum of 30% attendance per semester, including claims for ODs and medical emergencies Potential Students who have been incubated at KIIC may be permitted to take their University semester exams even if their attendance is below the minimum acceptable percentage, with the proper authorization from the head of the institution.
(On case-to-case basis depends upon the applicability strength, societal benefits and quality of the Innovation and Subsequent engagement of the students with the/ her business)

f) Any Students Innovators/entrepreneurs are allowed to opt their startup in place mini project /major project, /seminar and summer training etc. (In plant training, Internship, value added Course.). The area in which the student wishes to launch a Startup may be interdisciplinary or multidisciplinary.

g) Student's startups are to be evaluated by Expert committee, formed by KIIC and KAHE

Guide lines to award Credits/ Marks to a Student startup

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

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

PROGRAM OUTCOMES

By the end of the programme, our graduates will

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

PROGRAM SPECIFIC OBJECTIVES (PSOs):

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

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

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

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

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

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

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

MAPPING of PEOs and POs

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

DEPARTMENT OF COMPUTER APPLICATIONS
FACULTY OF ARTS, SCIENCE COMMERCE AND MANAGEMENT
UG PROGRAM (CBCS) – B.Sc. Computer Science (Artificial Intelligence and Data Science)
(2024–2025 Batch and onwards)

Course code	Name of the course	Category	Objectives and out comes		Instruction hours / week			Credit(s)	Maximum Marks			Page No.
			PSOs	POs	L	T	P		CIA	ESE	Total	
									40	60	100	
SEMESTER I												
24LSUT101/24LUH101/24LUM101/24LUS101/24LUF101	Language – I	AEC 1	1,2	3	4	-	-	3	40	60	100	1
24ENU101	English – I	MDC 1	3,4	3	3	-	-	3	40	60	100	15
24ADU101	Programming in C	Major 1	1,2, 3	1	5	-	-	4	40	60	100	18
24ADUA101	Numerical Methods	Minor 1	1,4,5	3	4	-		3	40	60	100	20
24ADU102	Introduction to Internet Technologies	Major 2	2,3, 4	1	4			3	40	60	100	22
24ADU111	Programming in C - Practical	Major 3	3,2, 4	1	-	-	4	2	40	60	100	24
24SEC111	Office Automation – Practical	SEC 1	3,4	3	-	-	4	2	40	60	100	26
24VAC101	Yoga for Youth Empowerment	VAC 1	5,6	3	2	-	-	2	40	60	100	28
Semester Total					**22**	**0**	**8**	**22**	**320**	**480**	**800**	
SEMESTER II												
24LSUT201/24LUH201/24LUM201/24LUS201/24LUF201	Language – II	AEC 2	5,9, 12	3	4	-	-	3	40	60	100	31
24ENU201	English - II	MDC 2	4,5	2	3	-	-	3	40	60	100	44
24ADU201	Object Oriented Programming	Major 4	1,3, 7	2	4	-	-	4	40	60	100	46
24ADUA201	Discrete Structures	Minor 2	5,6,9,	3	4	-	-	3	40	60	100	49
24ADU202	Design Thinking	Major 5	7,8, 11,15	1	4	-	-	2	40	60	100	51
24ADU203	Community Engagement and Social Resposibility	Major 7	9	3	2			2	100		100	53
24ADU211	Object Oriented Programming - Practical	Major 6	1,2, 5	1	-	-	4	2	40	60	100	55
24SEC211	Web Programming-Practical	SEC 2	2,5, 9,	1	-	-	3	2	40	60	100	57
24VAC201	Environmental Studies	VAC 2	9	2	2	-	-	2	100	-	100	60
Semester Total					**23**	**0**	**7**	**23**	**480**	**420**	**900**	

SEMESTER III												
24LSUT301/24LUH301/24LUM301/24LUS301/24LUF301	Language – III	AEC 3	6,8,9	3	4	-	-	3	40	60	100	62
24ENU301	English - III	MDC 3	4,5	3	3	-	-	3	40	60	100	75
24ADU301	Operating Systems	Major 8	1,2,6	1	5	-	-	3	40	60	100	77
24ADU302	Computer Networks	Major 9	2,6,9	1	4	-	-	3	40	60	100	79
24ADUA301	Operations Research	Minor3	6,7,9	3	4	-		3	40	60	100	81
24ADU311	Operating Systems - Practical	Major 10	1,2,7	1	-	-	4	2	40	60	100	83
24ADU312	Computer Networks - Practical	Major 11	1,2,7, 10	3	-	-	4	2	40	60	100	85
24VAC301	Indian Knowledge System	VAC 3	5,7	3	2	-	-	1	100	-	100	87
24ADU391	Internship	Summer Internship			-	-	-	2	100	-	100	89
				Semester Total	**22**	**0**	**8**	**22**	**480**	**420**	**900**	
SEMESTER IV												
24LSUT401/24LUH401/24LUM401/24LUS401/24LUF401	Language – IV	AEC 4	4,5,7	3	4	-	-	3	40	60	100	90
24ENU401	English-IV	SEC 3	4,5	3	3	-	-	3	40	60	100	101
24ADU401	Relational Database Management Systems	Major 12	1,2,7,8, 9	3	4	-	-	3	40	60	100	103
24ADU402	Network Security	Major 13	3,4,8	2	4	-	-	2	40	60	100	105
24ADU403	Fundamentals of Artificial Intelligence	Major 14	4,7,11	2	3			3	40	60	100	107
24ADUA401	Probability and Statistics	Minor 4	5,7	1	4	-	-	3	40	60	100	109
24ADU411	Relational Database Management Systems - Practical	Major 15	4,5,9	3	-	-	3	2	40	60	100	112
24ADU412	Network Security - Practical	Major 16	1,2,4,7, 11	2			3	2	40	60	100	118
24VAC401	Universal Human Values	VAC 4	7,8	3	2	-	-	1	100	-	100	121
				SEMESTER TOTAL	**24**	**0**	**6**	**22**	**420**	**480**	**900**	

SEMESTER V												
24ADU501	Digital Identity and Access Management	Major 17	1,2,3,4, 13	3	4	-	-	3	40	60	100	124
24ADU502	Fundamentals of Data Science	Major 18	1,2,7,8, 9	1	5	-	-	3	40	60	100	126
24ADU503A	Data Visualization	Major 19	2,8,9	1	4	-	-	3	40	60	100	128
24ADU503B	Computer Graphics		1,2,7,9	1								130
24ADUA504	Resource Management Techniques	Minor 5	3,5,7	2	4	-	-	3	40	60	100	132
24ADU511	Fundamentals of Data Science – Practical	Major 20	1,2,4,9,	1	-	-	4	2	40	60	100	134
24ADU512A	Data Visualization– Practical	Major 21	3,7,8,9	3	-	-	5	2	40	60	100	136
24ADU512B	Computer Graphics - Practical		1,2,7,9,	3	-	-						138
24ADUE501X	Elective Major	Major 22	1,2,3,4	2	4	-	-	3	40	60	100	140
24ADU591	Internship	Summer Internship	-	-	-	-	-	2	100	-	100	141
SEMESTER TOTAL					**21**	**0**	**9**	**21**	**380**	**420**	**800**	
SEMESTER VI												
24ADU601	Software Engineering	Major 23	5,9,12	3	6	-	-	5	40	60	100	142
24ADU602A	Machine Learning	Major 24	1,4,9	1	6	-	-	4	40	60	100	144
24ADU602B	Big Data Analytics		1,2,3,1 5	1								146
24ADU612A	Machine Learning-Practical	Major 25	7,8,9,1 2,14	2	-	-	4	2	40	60	100	148
24ADU612B	Big Data Analytics-Practical											150
24ADUEA601X	Elective Minor	Minor 6	4,5,9	2	6		-	3	40	60	100	152
24ADU691	Project	Major 26	1,2,4	3	-	-	8	6	40	60	100	153
	ECA / NCC / NSS / Sports / General interest etc		-	-	-	-	-	2	100	-	100	154
SEMESTER TOTAL					**18**	**0**	**12**	**22**	**300**	**300**	**600**	
GRAND TOTAL					**130**	**0**	**50**	**132**	**2380**	**2520**	**4900**	
SEMESTER VII												
24ADU701	Deep Learning	Major 27	4,5,9	1	6	-	-	4	40	60	100	158
24ADU702	Natural Language Processing	Major 28	7,8,9	1	6	-	-	4	40	60	100	160
24ADUA701	Statistical Computing	Minor 7	6,8	3	6	-	-	4	40	60	100	162
24ADU711	Deep Learning – Practical	Major 29	3,4,9	1	-	-	6	4	40	60	100	164
24ADU712	Natural Language Processing – Practical	Major 30	3,5,8	1	-	-	6	4	40	60	100	166
SEMESTER TOTAL					**18**	**0**	**12**	**20**	**200**	**300**	**500**	

SEMESTER VIIIA												
24ADU801A	Fullstack Development	Major 31	3,5,7	1	6	-	-	4	40	60	100	168
24ADU802	Social Network Analysis	Major 32	2,4,7,9	2	6	-	-	4	40	60	100	170
24ADUA803	Organizational Behavior	Minor 8	2,3,8	1	6	-	-	4	40	60	100	172
24ADU811A	Fullstack Development - Practical	Major 33	3,4,7	1		-	6	4	40	60	100	174
24ADU812	Social Network Analysis – Practical	Major 34	3,5,7,11	2	-	-	6	4	40	60	100	176
SEMESTER TOTAL					**18**	**0**	**12**	**20**	**200**	**300**	**500**	
SEMESTER VIIIB												
24ADU801B	Research Methodology and IPR	Major 35	3,5,7	1	6	-	-	4	40	60	100	178
24ADUA811B	Statistical Analysis using R Practical	Minor 9	1,3,5,8	1	6	-	-	4	40	60	100	181
24ADU891	Research Project/Preparation of Research Project	Major 36	2,3,7	1		-	18	12	100	200	300	183
SEMESTER TOTAL					**12**	**0**	**18**	**20**	**180**	**320**	**500**	
GRAND TOTAL					**166**	**0**	**74**	**172**	**2780**	**3120**	**5900**	

Ability Enhancement Courses (AEC)		
Semester	**Course Code**	**Name of the Course**
I	24LSUT101/24LUH101/ 24LUM101/24LUS101/ 24LUF101	Language –I
II	24LSUT201/24LUH101/ 24LUM201/24LUS201/ 24LUF201	Language –II
III	24LSUT301/24LUH301/ 24LUM301/24LUS301/ 24LUF301	Language –III
IV	24LSUT401/24LUH401/ 24LUM401/24LUS401/ 24LUF401	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 Courses		
Semester	**Course Code**	**Name of the Course**
I	24ADU101	Programming in C
	24ADU111	Programming in C-Practical
	24ADU102	Introduction to Internet Technologies
II	24ADU201	Object Oriented Programming
	24ADU211	Object Oriented Programming – Practical
	24ADU202	Design Thinking
	24ADU203	Community Engagement and social Responsibility
III	24ADU301	Operating Systems
	24ADU302	Computer Networks
	24ADU311	Operating Systems-Practical
	24ADU312	Computer Networks -Practical

IV	24ADU401	Relational Database Management System
	24ADU402	Network Security
	24ADU403	Fundamentals of Artificial Intelligence
	24ADU411	Relational Database Management System-Practical
	24ADU412	Network Security -Practical
V	24ADU501	Digital Identity and Access Management
	24ADU502	Fundamentals of Data Science
	23ADU503A	Data Visualization
	24ADU503B	Computer Graphics
	24ADU511	Fundamentals of Data Science- Practical
	24ADU512A	Data Visualization - Practical
	24ADU512B	Computer Graphics- Practical
VI	24ADU601	Software Engineering
	24ADU602A	Machine Learning
	24ADU602B	Big Data Analytics
	24ADU612A	Machine Learning-Practical
	24ADU612B	Big Data Analytics-Practical
	24ADU691	Project
VII	24ADU701	Deep Learning
	24ADU702	Natural Language Processing
	24ADU711	Deep Learning-Practical
	24ADU712	Natural Language Processing -Practical
VIII A	24ADU801A	FullStack Development
	24ADU802	Social Network Analysis
	24ADU811A	FullStack Development-Practical
	24ADU812	Social Network Analysis-Practical
VIII B	24ADU801B	Research Methodology and IPR
	24ADU891	Research Project/Preparation of Research Project

Minor		
Semester	**Course Code**	**Name of the Course**
I	24ADUA102	Numerical Methods
II	24ADUA202	Discrete Structures
III	24ADUA301	Operations Research
IV	24ADUA401	Probability and statistics
V	24ADUA504	Resource Management Techniques
VII	24ADUA701	Statistical Computing
VIII-A	24ADUA803	Organizational Behavior
VIII-B	24ADUA811B	Statistical Analysis using R- Practical

Skill Enhancement Courses (SEC)		
Semester	**Course Code**	**Name of the Course**
I	24SEC111	Office Automation-Practical
II	24SEC211	Web Programming -Practical
IV	24ENU401	English IV

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

Summer Internship		
Semester	**Course Code**	**Name of the Course**
I	24ADU391	Summer Internship
V	24ADU591	Summer Internship

Elective Major		
Semester	**Course Code**	**Name of the Course**
V	24ADUE501A	Natural Language Processing
	24ADUE501B	Quantum Computing
	24ADUE501C	Augmented Reality (AR)and Virtual Reality (VR)
	24ADUE501D	Mobile Application Development
	24ADUE501E	Game Development
Elective Minor		
VI	24ADUEA601A	Digital Forensics
	24ADUEA601B	Parallel And Distributed Computing
	24ADUEA601C	Devops And Continuous Integration
	24ADUEA601D	Embedded Systems
	24ADUEA601E	Bioinformaticss

Course Distribution Table:

Category	**No. of Courses**		**Total**
	Theory	**Practical**	
Major	18	15	33
Minor	8	1	9
AEC	4	0	4
MDC	3	0	3
SEC	1	2	3
VAC	4	0	4
	38	18	56

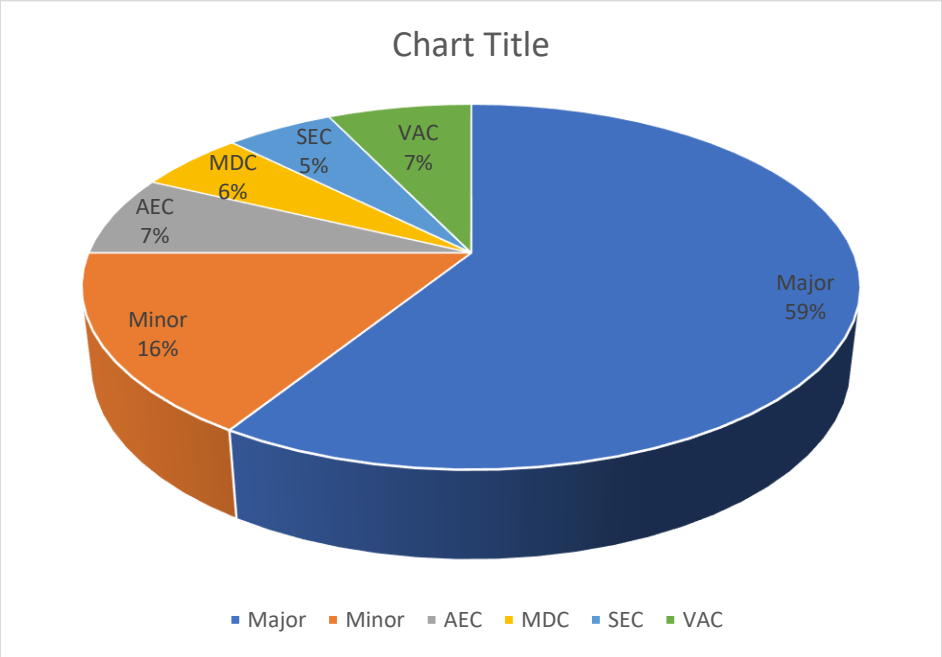


Chart Title
SEC 5%
VAC 7%
MDC 6%
AEC 7%
Major 59%
Minor 16%
Major
Minor
AEC
MDC
SEC
VAC

Semester I

24LSUT101 **LANGUAGE – I / இலக்கிய இன்பம்** **4H - 3C**

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

End Semester Exam: 3 Hours

PREREQUISITE:

- Student Must studied Tamil from 1st standard to higher secondary level.

பாடத்திட்டப் பொதுநோக்கம்

- மாணவர்களுக்குத் தமிழ்மொழி வரலாறு மற்றும் இலக்கியங்களின் வழியாக வாழ்வியல் மதிப்புகளை உணர்த்துதல்.
- சிந்தனைத் திறனையும், படைப்பாக்கத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும் மேம்படுத்துதல்.
- வேலைவாய்புக்குரிய வகையில் மொழித்திறனை மேம்படுத்துதல்.

பாடத்திட்டப் பயன்விளைவு

- தமிழ்மொழி வரலாறு குறித்த தெளிந்த அறிவு பெற்றிருத்தல்.
- வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை பெற்றிருத்தல்.
- படைப்பிலக்கியத்திறன் பெற்றிருத்தல்.
- இந்தியக் குடியுரிமைப்பணி முதலான போட்டித் தேர்வுகளில், விருப்பப்பாடமாக இடம்பெறுகின்ற,'தமிழ் இலக்கியவரலாறு' தமிழ் இலக்கண அறிவு மேம்பாடு பெற்றிருத்தல்.
- மொழிபெயர்ப்பியல், கணினித்தமிழ் சார்ந்த வேலைவாய்ப்புத்திறன் மேம்பாடு.

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 - விண்இன்று பொய்ப்பின், 34 - மனத்துக்கண் மாசிலன் ஆதல்

இல்லற இயல் - இல்வாழ்க்கை - 41- அன்பும் அறனும் உடைத்தா 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 - 'வார்ஒலிகூந்தலை' – 'சிறப்பின் கண்ணகிதனக்குஎன்' (84-90)

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

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

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

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

வஞ்சிக் காண்டம் - நடுகல்காதை - 'மதுரைமூதூர்' - ' 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)

சொல்இலக்கணம் - 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 -ஔவையார்- கொன்றை வேந்தன் (1-50 பாடல்கள்)

காப்பியம் - சூளாமணி–அரசியல்சருக்கம்- 1. நாவியே 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 மன்னனின் துறவுநெறி -1. மன்னிய புகழி(1840), 2. திருமகிழலங்கன் (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)**

சிற்றிலக்கியங்கள் 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, எப்புவிகளும், வைத்தவர், ஈன்றவர்.

காப்பியம் – கம்பராமாயணம் – சுந்தரகாண்டம் (தேர்ந்தெடுக்கப்பட்ட பாடல்கள்

மட்டும்) வண்மையில்லை 84 - தாய் ஒக்கும் 171 - ஒரு பகல் 284 - எதிர் வரும் 314 – தருவனத்துள் 327 - எண் இலா 328 - சொல் ஒக்கும் 413 – இவ்வண்ணம் 559 - எண் அரு 598 - தடுத்து இமையாமல் 1979 - தோள் கண்டார் 1008 – மைந்தரை 1339 – அந்நகர் 1445 - சிவந்த வாய் 1550 - ஏய வரங்கள் 1593 – நின்மகன் 1526 – ஆழிசூழ் 1601 – மன்னவன் 1604 – பின்னும் 1752 – கிள்ளையொடு 1701 – எந்தையும் 2159 - பஞ்சி ஒளிர் 2762 - மயில் உடை 3248 – ஆண்டு 3390 –மற்றுஇனி 3812- கண்டனன் 5249 – வேலையுள் 6037 –மண்ணொடும் 6038- வாங்கிய 6170 – இங்குஉள 6172 – கண்டனென் 6031 - பைய பைய 6174 – அந்நெறி 6185 – குகனொடும் 6507 –கூவி 7131 – மாக்கூடு 7760 – அற்றவன் 9168 - ஆள் ஐயா 7271 - கார்நின்ற-10043.

கடிதப்பயிற்சி

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

அலகு – 5 **(8 மணிநேரம்)**

காப்பியங்கள் - தோற்றமும் வளர்ச்சியும்

சங்க இலக்கியம் - பத்துப்பாட்டு: சிறுபாணாற்றுப்படை

வானம் வாய்த்த – யாம் அவண்நின்றும் 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.

மொத்த மணிநேரம் 48

பார்வை நூல்கள்

1. **கற்பகச் சோலை – தமிழ்ப்பாட நூல், இலக்கிய நெறிகள்,** தமிழ்த்துறை வெளியீடு, கற்பகம் உயர்கல்விக்கழகம், கோயம்புத்தூர் – 21.
2. **தமிழ் இலக்கிய வரலாறு, முனைவர் கா.கோ. வேங்கடராமன்,** கலையக வெளியீடு, நாமக்கல்.

இணையதளம்

1. www.tvu.org.in
2. www.maduraitamilproject.com

இதழ்கள்

1. International Research Journal of Indian Literature, irjil.in
2. International Tamil Research Journal, iorpress.in

CO, PO, PSO Mapping

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

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

Semester I

24LUH101	**HINDI-PAPER- I**	**4H-3C**

(Prose, Non-detailed, Nibandh, Grammar)

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

PREREQUISITE:

Not Required

COURSE OBJECTIVES(CO):

- Understand the text styles and grammatical elements
- Discuss the content of a reading passage
- Develop an interest in the appreciation of short stories

COURSE OUTCOMES(COs) :

- Develop an interest in the appreciation of literature.
- Discuss and respond to content of a reading passage.
- Learning the literacy knowledge of Hindi specially reading and writing .
- Learning the literary knowledge specially reading and understanding of Hindi short Stories
- Learning the history of Hindi literature.

UNIT I a) Prose - Bharathiya Sangrah **9 HOURS**

b) Non-Detailed - Naya Mehman

c) Nibandh - Anushasan

d) Grammar - Bhasha Aur Vyakaran

UNIT II a) Prose - Pahtha Pani Nirmal **9 HOURS**

b) Non-Detailed - Eakankki ki Visheshatha

c) Nibandh - Onam

d) Grammar – Varna Vichar , Sangya

UNIT III a) Prose – Rashtriya Pitha Mahathma **10 HOURS**

b) Non-Detailed – Maha Bharat ki Eak Sanjh

c) Nibandh – Eakatha Ka Mahathva

d) Grammar – Sarvanam , Gender

UNIT IV a) Prose – Gapshap **10 HOURS**

b) Non-Detailed – Yahang Sona Mana Hai

c) Nibandh – Ganga Pradhushan Ki Samasya

d) Grammar – Number , Karak , Visheshan

UNIT V a) Prose – Nindha Ras **10 HOURS**

b) Non – Detailed Eakanki ki Katha Vasthu

c) Nibandh – Paropkar

c) Nibandh – Paropkar

d) Grammar - Kriya , Kriya Visheshan

TOTAL: 48 HOURS

REFERENCE BOOKS:

I. Prose :Nuthan Gathya Sangrah (lesson-1,5,6,8,9).

Editor : Jayaprakash

Publisher : Sumithra Prakasan,

16|5.Hasting Road,

Illahabad.211001.

ll. Non-detailed: Naveen Ekhanki Sangrah

Editor : Dr. Srimathi Malathi Tiwari

Publisher: Sumithra Prakashan,

204.Leela Apartment,

Ashok Nagar, Illahabad-211001.

lll. Nibandh : Subod Hindi Nibandh

Editor : Dr. Braj Kishor Prasad SingPublisher: Manoj Publication 1583-84 Dariba Kala, Chandni Chouk, Delhi – 110006.

IV Grammar: Sugam Hindi Vyakaran

Writer: Pro. Vamshidhar & Dharmapal

Publication: Shiksha Bharathi, Kashmir Gat, Delhi - 110006

CO, PO, PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO14	PO14	PO15	PSO2	PSO1
CO1	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	**2.8**	**2.4**	**2.4**	**-**	**-**	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-

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

Semester I

24LUM101 **MALAYALAM I** **4H-3C**

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

PREREQUISITE:

Not required

COURSE OBJECTIVE(CO):

- Improves grammatical knowledge
- Will continue to read and learn about articles and think about them
- It is possible to read and understand short stories and understand the thoughts and life ofthe people of this state.

COURSE OUTCOME(COs):

- Understand the text styles and grammatical elements
- Discuss the content of a reading passage
- Develop an interest in the appreciation of short stories
- Comprehend the grammatical structures and sentence making
- Understand the language and developing English to Malayalam translation skill

	PART I MALAYALAM PAPER I	
Unit No.		**HOURS**
I	Novel – Pathummayude Aadu - Vaikam Muhammed Basheer	**10**
II	Novel- - Pathummayude Aadu - Vaikam Muhammed Basheer	**10**
III	Short Story - Ente Priyappeta Kadhakal – Akbar Kakkattil)	**09**
IV	Short Story - Ente Priyappeta Kadhakal – Akbar Kakkattil)	**10**
V	Composition &Translation(English to Malayalam)	**09**
	TOTAL	**48**

TEXT BOOKS:

1. Novel- PathummayudeAadu - Vaikam Muhammed Basheer(D.C.Books, Kottayam, Kerala)
2. Short Story - Ente Priyappeta Kadhakal – Akbar Kakkattil)(D.C. Books, Kottayam, Kerala)
3. Expansion of ideas, General Eassay and Translation. (A simple passage)

REFERENCE BOOKS:

1.Malayala Novel Sahithya Charitram-K.M.Tharakan (N.B.S.Kottayam)
2.Cherukatha Innale Innu-M.Achuyuthan (D.C Books, Kottayam)
3.Sahithya CharitramPrasthanangalilude- Dr.K.M George, (D.C.Books Kottayam)
4. MalayalaSahithyavimarsam-Sukumar Azheekode (D.C.books)

CO, PO, PSO Mapping

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

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

Semester I

24LUS101 **SANSKRIT I** **4H-3C**

(POETRY, GRAMMAR AND TRANSLATION**)**

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not required

COURSE OBJECTIVES(CO):

- The fundamental objective of the curriculum is to impart effective science education at the undergraduate level, exposing them to recent trends and developments in the subject.
- Creating scientific temper is another major objective of this curriculum.
- Another major thrust given here is to develop an environmental concern in all activities ofthe students. 'Go green', the motto of the syllabus emphasizes the urgent need to conserve nature without destruction of natural resources.

COURSE OUTCOMES(COs) :

- **Critical Thinking** :Take informed actions after identifying the assumptions that frame students' thinking and actions.
- **Problem Solving**: Understand and solve problems of relevance to society to meet the specified needs using the knowledge, skills and attitudes acquired.
- **Effective Communication**: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.
- **Effective Citizenship**: Demonstrate empathetic social concern and equity centered national development.
- **Environment and Sustainability**: Understand the issues of environmental contexts and sustainable development.

UNIT I **9 HOURS**

Introduction to Poetry, Definition of Poetry

UNIT II **9 HOURS**

Five Maha Kavyas

UNIT III **10 HOURS**

Text Prescribed : Raghuvamsa (Canto – 1) First Ten Slokas

UNIT IV **10 HOURS**

Text Prescribed : Raghuvamsa (Canto – 1) Slokas Eleven to Thirty

UNIT V **10 HOURS**

Text Prescribed : Raghuvamsa (Canto – 1) Slokas Thirty One to Fifty

Grammar: Text prescribed : Sanskrit Self TeacherBy Dr.V.Varadhachari

(Present tense and Declension of „a" endingnouns (Masculine)

TOTAL: 48 HOURS

TEXT BOOKS:

1.Raghuvamasa (Canto – 1)R.S.Vadhyar and Sons Palghat, Kerala

2.Sanskrit Self Teacher By Dr.V.VaradhachariT.S.Sriraman 32, Tank Bund Road Near Loyola College, Nungambakkam Chennai 600 034.

CO, PO, PSO Mapping

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

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

Semester I

24LUF101 **FRENCH I** **4H-3C**

(Leçon, Communication, Grammaire, Verbes, Lexique, Culture)

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

The objectives of this course are:

- To enable the learner to communicate effectively and appropriately.
- To develop and integrate the use of the four language skills.
- To train students to acquire proficiency in French by reading different genres of literature and learning grammar.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	retrieve fundamentals of French language to construct error free sentences.	Apply
CO2	construct and maintain social relationships.	Analyze
CO3	construct business letters, proposals and E-Mail communication	Apply
CO4	Adopt the skills of planning, structuring, and delivery techniques in group discussions and presentations.	Understand
CO5	classify communication skills in business environment	Understand

UNITE I **9 HOURS**

a) Leçon – Bienvenue

b) Communication –Un cours de francais,Entrer en contact saluer,

c) Verbes - être ou avoir

d) Lexique –Les couleurs, l' alphabet

e) Culture – La France

UNITÉ II **9 HOURS**

a) Leçon -Bonjour ça va ?

b) Communication -Demander et dire,Comment ça va

c) Verbes – Les verbes réguliers en –er.

d) Lexique - Les Pays et les nationalités , Les animaux domestiques, Les jours de la semaine.

e) Culture – La France et la Francophonie

UNITÉ III **10 HOURS**

a) Leçon - Salut ! Je m'appelle Agnès

b) Communication - Se présenter et présenter quelqu'un Demander et dire la date

c) Grammaire - Les pronoms personnels sujets ,Les verbes être et avoir , Les articles définis et indéfinis

d) Verbes - Les verbes aller et venir

e) Lexique - Les mois de l'année, Les nombres de 0 à 69 » La famille (1)

f) Culture - La France physique et politique

UNITÉ IV **10 HOURS**

a) Leçon - Qui est-ce ? Dans mon sac, j ' ai

b) Communication - Demander et répondre poliment ,Demander des informations Personnelles

c) Grammaire - La formation du feminine, La formation du pluriel , Le adjectifs possessifs

d)Verbes -Les verbes ir et re

e)Lexique -Les professions ,Quel ques objets ,La fiche d'identité

f)Culture -Les symbols de la France,

UNITÉ V **10 HOURS**

a) Leçon - Il est comment ? Allô ?

b)Communication - Décrire l'aspect physique et le caractère Parler au téléphone

c)Grammaire - La formation du féminin , La phrase interrogative

Qu'est-ce que... ? La phrase négative

d)Verbes - Le verbe Faire

e) Lexique - L'aspect physique , Le caractère, Les prépositions de lieu , Les nombres à partir de 70

f) Culture - Les frontiers de la france,les villes connues en france.

TOTAL: 48 HOURS

REFERENCE BOOKS:

1. Cocton Marie –Noëlle , Duplex Dorothée, Heu Elodie , Kasazian Emilie, Ripaud Delphine, **Saison 1- Méthode de francais**, Didier, paris.2015.
2. Cocton Marie – Noëlle, Dupleix, Heu Elodie, Kasazian Emilie ,Ripaud **Deldphin, Saison 1 – Cahier d'activites** , Dider ,Paris , 2015
3. Anne Akyüz,Bernadette Bazelle- Shahmael,JoëlleBonenfant, Marie- Françoise Gliemenn,**Les exercices de grammaire**,Hachette FLE, Paris,2005
4. Christian Beaulieu, Je **pratique, Exercises de grammaire A1**, Dider,Paris,2015
5. Nathalie BIE, philippe SANTINAN,**Grammaire pour adolescents-250 exercises,** CLE International , Paris , 2005

WEBSITES :

1. http:// enseigner.tv5 monde.com/
2. bonjourdumonde.com /exercises/contenu/le – francais-du- tourisme.html
3. http://www.bonjurdefrance.com/
4. https://www.lepointdufle.net/

CO, PO, PSO Mapping

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

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

Semester I

24ENU101 **ENGLISH – I** **3H - 3C**

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not required

COURSE OBJECTIVES(CO):

- To enable the learner to communicate effectively and appropriately.
- To develop and integrate the use of the four language skills.
- To train students to acquire proficiency in English by reading different genres of literature and learning grammar.

COURSE OUTCOMES (COs):

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	Construct and maintain social relationships.	Analyze
CO3	Construct business letters, proposals and E-Mail communication	Apply
CO4	Adopt the skills of planning, structuring, and delivery techniques in group discussions and presentations.	Understand
CO5	Classify communication skills in business environment	Understand

UNIT I **8 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 **7 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

TOTAL: 36 HOURS

TEXT BOOK

1. Board of Editors , *Acrostic I* (2024*)*. Karpagam Academy of Higher Education

REFERENCE BOOKS:

1. Martin's, St (2013). *Oxford Handbook of Writing: Handbook of Writing.* Cambridge University Press.
2. Julian Treasure ,*Sound Business*, (2012). Oxford University Press
3. Hornby, A,S.(1975). *The Guide to patterns and usage in English:* oxford university Press.
4. Ellis, R.(1990). *Instructed second language acquisition,* Oxford: oxford university Press New York:Pergamon Press.

WEB SITES:

1. https://langster.org/en/blog/fundamentals-of-english-grammar-everything- you- need-to-know/
2. https://medium.com/@phonicstandardvideo.am/fundamentals-of-english- grammar-for-novices-24b355d2cd83

CO, PO, PSO Mapping

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

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

Semester I

24ADU101 PROGRAMMING IN C 5H - 4C

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

End Semester Exam: 3 Hours

PREREQUISITE:

- Basic programming concepts such as variables, control structures, and functions

COURSE OBJECTIVES (CO):

- 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

COURSE OUTCOMES (COs):

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

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

UNIT I OVERVIEW OF C 12 HOURS

- 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 - Assigningvalues 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 12 HOURS

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 12 HOURS

Array:- 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 **12 HOURS**

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

UNIT V FILE MANAGEMENT **12 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.

TOTAL:60 HOURS

TEXT BOOKS:

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.

REFERENCE BOOKS:

1. Behrouz A. Forouzan and Richard F. Gilberg, 2000.*Computer Science: A Structured Programming Approach Using C*, 3rd Edition.
2. 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

CO, PO, PSO Mapping

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

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

Semester I

24ADUA101 NUMERICAL METHODS 4H - 3C

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

End Semester Exam: 3 Hours

PREREQUISITE:

- Understanding of basic calculus.

COURSE OBJECTIVES (CO):

- To learn the fundamental methods for solving numerical algebraic and transcendental equations.
- To understand various techniques for solving simultaneous linear algebraic equations.
- To gain knowledge of interpolation, numerical differentiation, numerical integration, and numerical solutions of ordinary differential equations.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Apply numerical analysis which has enormous application in the field of science.	Apply
CO2	Implement numerical methods to solve systems of simultaneous linear algebraic equations.	Apply
CO3	Summarize the principles of Gregory-Newton forward and backward and Lagrange's Interpolation formulas.	Understand
CO4	Explain numerical differentiation and numerical integration formulas.	Understand
CO5	Implement numerical methods to solve ordinary differential equations.	Apply

UNIT I SOLUTIONS OF NUMERICAL ALGEBRAIC AND TRANSCENDENTAL EQUATIONS 10 HOURS

Bisection method - Iteration method - False Position method - Newton's method.

UNIT II SOLUTION OF SIMULTANEOUS LINEAR ALGEBRAIC EQUATION 10 HOURS

Gauss elimination method - Gauss Jordon method - Gauss Jacobi method - Gauss Seidel methods.

UNIT III INTERPOLATION 10 HOURS

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

UNIT IV NUMERICAL DIFFERENTIATION AND INTEGRATION 9 HOURS

Numerical Differentiation: Newton's forward difference and Newton's backward difference formula. Numerical Integration: Trapezoidal Rule and Simpson 's Rule.

UNIT V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS

9 HOURS

Taylor's series - Euler's method – Modified Euler's method - Runge-Kutta methods (Fourth order Runge - Kutta method only).

TOTAL: 48 HOURS

TEXT BOOKS:

1. Kandasamy, P., Thilagavathi K. and 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.

REFERENCE BOOKS:

1. Veera Rajan T. and Ramachandran T. (2008). *Numerical Methods with Programs in C*, Tata McGraw-Hill Publishing company limited, New Delhi.
2. 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

CO, PO, PSO Mapping

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

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

Semester I

24ADU102 INTRODUCTION TO INTERNET TECHNOLOGIES 4H - 3C

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

End Semester Exam: 3 Hours

PREREQUISITE:

Basic networking principles and protocols.

COURSE OBJECTIVES (CO):

- The objective of this course is to provide the knowledge about internet fundamentals.
- The student will learn the Concepts and techniques in the internet connectivity and Network.
- The student will understand the concepts of Browser and Email.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Rephrase the fundamental knowledge of internet	Understand
CO2	Solve the concepts of internet connectivity and Network	Apply
CO3	Contrast how to apply the major concepts to implement Browser and Email working.	Understand
CO4	Classify the Program development using HTML, Tables, BLOCKS, Tags	Analyze
CO5	Develop programs using Server-side Technologies and hybrid technologies, Proxy Servers	Create

UNIT I INTRODUCTION TO INTERNET 10 HOURS

Internet- Growth of Internet and ARPANet - Owners of the Internet -Anatomy of Internet – History of WWW - Basic Internet Terminologies – Net etiquette - Internet Applications - Commerce on the Internet Governance on the Internet - Impact of Internet on Society.TCP/IP Internet Technology and Protocols: Packet Switching Technology - Internet Protocols - TCP/IP – Router - Internet Addressing Scheme-Machine Addressing - E-mail Addresses – Resource Addresses.

UNIT II INTERCONNECTIVITY 10 HOURS

Connectivity types - Setting up a connection - Hardware requirements- Selection of a modem - Software requirements – Internet accounts by ISP-ISDN-Protocol options-Service options. Internet Network: Network Definition- Common terminologies – Node - Host- Workstation -Network Administrator - Network security - Network Components – Servers-client Server- Communication Media - Types of Networks - Addressing in Internet – DNS - Network topologies – Ethernet – FDDI - ATM.

UNIT III BROWSERS AND SEARCH ENGINES 10 HOURS

Browsers - What is a browser? – Parts of a browser window-Running a browser - working with a Browser. Search engines: What is search engine? - Types of search engines - Search and meta search engines.

E-mail: E-mail - E-mail Networks and Servers - E-mail Protocols - Structure of E- mail - Attachments – E-mail Clients - E-mail Clients - web based E-mail- Address book – Signature File

UNIT IV HTML Programming Basics **8 HOURS**

Introduction to HTML – HTML browsers - Different versions of HTML-HTML tags - Document overview - Header elements - Section headings - Block headings - Lists-Inline elements – Images - working with Tables, Forms, Frames.

UNIT V WEB SERVERS **10 HOURS**

Introduction, Working, Configuring, Hosting and Managing a Web server, Proxy Servers: Introduction, Working, Type of Proxies, setting up and managing a proxy server Client-side Technologies, Server-side Technologies and hybrid technologies.

TOTAL: 48 HOURS

TEXT BOOKS:

1.Internet Technology and Web design, Ramesh Bangia, Firewall Media, (An imprint of Lakshmi Publications Pvt. Ltd.), Third Edition, 2011.

2. Greenlaw R. & Hepp E, (2007). Fundamentals of Internet and WWW. 2nd edition. Tata McGrawHill.

3. Godbole, A. S.& Kahate A (2008). Web Technologies. Tata McGrawHill

Unit I : Chapters 1 and 2

Unit II : Chapters 3 and4

Unit III : Chapter 5(5.6), Chapter 8(8.11 &8.13)

Unit IV : Chapter 5 (5.1) & Chapter6 & Chapter 9

Unit V : Chapter 8

REFERENCE BOOKS:

1. Douglas E. Comer, Fourth Edition, *The Internet Book*, PHI Learning Pvt. Ltd. , New Delhi, 2009.

2.Young Kai Seng, *Using the Internet the Easy Way*, Minerva Publications, First Edition, 2000.

3.Alexis Leon and Mathews sLeon,,*Fundamentals of Information Technology*,Vikas Publishing House Pvt. Ltd., Revised Edition.

WEBSITES:

1.https://www.tutorialspoint.com/internet_technologies/pdf/internet_quick_guide.pdf

CO, PO, PSO Mapping

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

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

Semester I

24ADU111 PROGRAMMING IN C - PRACTICAL 4H - 2C

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

End Semester Exam: 3 Hours

PREREQUISITE:

C syntax, data types, and control structures.

COURSE OBJECTIVES (CO):

- 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.

COURSE OUTCOMES (COs):

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

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

LIST OF PROGRAMS

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>3and 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.

TOTAL:48 HOURS

TEXT BOOKS:

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.

REFERENCE BOOKS:

1. Behrouz A. Forouzan and Richard F. Gilberg, 2000.Computer Science: A Structured Programming Approach Using C, 3rd Edition.

2. Herbert Schildt, 2000.C: The Complete Reference, 4th Edition.

WEBSITES:

1.www.programiz.com / c-programming

2.www.cplusplus.com

3.www.learncpp.com

CO, PO, PSO Mapping

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

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

Semester I

24SEC111 OFFICE AUTOMATION – PRACTICAL 4H - 2C

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

End Semester Exam: 3 Hours

PREREQUISITE:

office software applications and basic computer skills.

COURSE OBJECTIVES (CO):

- To acquire knowledge on word editor, spreadsheet and slide preparation.
- To create tables and learn mail merge in MSWord.
- To apply formulas in spreadsheet and draw graphs in Excel

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Demonstrate the concept of word processing.	Understand
CO2	Illustrate the tools in Microsoft word	Understand
CO3	Outline and Apply Excel Features	Understand
CO4	Summarize and apply the basic concepts using the software	Understand
CO5	Discover the different designs of MS Presentation	Analyze

LIST OF PROGRAMS:

I. MS-Word

1. Text Manipulation: Write a paragraph about your institution and Change the font size and type, Spell check, Aligning and justification of Text.
2. Bio data: Prepare a Bio-data.
3. Find and Replace: Write a paragraph about yourself and do the following. Find and Replace - Use Numbering Bullets, Footer and Headers.
4. Tables and manipulation: Creation, Insertion, Deletion (Columns and Rows). Create a mark sheet.
5. Mail Merge: Prepare an invitation to invite your friends to your birthday party. Prepare at least five letters.

II. MS-Excel

1. Data sorting-Ascending and Descending (both numbers and alphabets).
2. Mark list preparation for a student.

3. Individual Pay Bill preparation.
4. Invoice Report preparation.
5. Drawing Graphs. Take your own table.

III. MS-Powerpoint

1. Create a slide show presentation for a seminar.
2. Preparation of Organization Charts.
3. Create a slide show presentation to display percentage of marks in each Semester for all students

   (1) Use bar chart (X-axis: Semester, Y-axis: % marks).

   (2) Use different presentation template different transition effect for each slide.

TOTAL:48 HOURS

TEXTBOOKS:

1. Saxena, S. (2019). *A First Course in Computers (Based on Windows 8 And MS Office 2013)*. Vikas Publishing.
2. Gurley, R. G. (2018). *A Conceptual Guide to OpenOffice.org 3*. CreateSpace Independent Publishing Platform.
3. Leon, A., Leon, M., Leon, L., & VijayNicole. (2018). *Introduction to Information Technology*. Imprints Pvt. Ltd.

REFERENCE BOOKS:

1. Gurley, R. G. (2017). *A Conceptual Guide to OpenOffice.Org 2 for Windows and Linux*.
2. Walkenbach, J., Tyson, H., Wempen, F., Prague, C. N., Groh, M. R., Aitken, P. G., & Bucki, L. A. (2017). *Microsoft Office 2017 Bible*. Wiley India Pvt. Ltd.
3. Sinha, P. K. (2017). *Computer Fundamentals 2017*. BPB Publications.

WEBSITES:

1. https://www.tutorialspoint.com/word/word_tutorial.pdf
2. https://it.fit.edu
3. https://www.tutorialspoint.com/excel/excel_pdf_version.htm
4. https://web.itu.edu.tr/~tasking/Gulsen_Taskins_homepage/bil101e_files/powerpoint_how_to.pdf
5. https://www.srsd.net/tech/docs/powerpointbeginnerstutorial.pdf

CO, PO, PSO Mapping

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

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

Semester I

24VAC101 YOGA FOR YOUTH EMPOWERMENT 2H - 2C

Instruction Hours / Week: L:2 T:0 P:0 **Marks:** Internal**: 40** External**: 60 T**otal**: 100**

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES(CO):

- To create awareness about Yoga and Physical Health
- To providing Value Education to improve the students character understanding Greatness of Life force and Mind
- To know about five aspects of life and to develop good Qualities and eliminating bad ones
- To Learn introspection practices like Analysis of Thoughts, Moralization of Desires, Neutralization of Anger and Eradication of Worries Diversity in Men (Why Men Differ).
- To understand about the yoga, life and practice Yogasanas.

COURSE OUTCOMES(COs):

Learners should be able to

COs	Course Outcomes	Blooms Level
CO1	Understand the concepts of about Yoga and Physical Health	Understand
CO2	Study the concepts a Greatness of Life force and Mind	Understand
CO3	Learn the aspects of Personality Development - Sublimation	Understand
CO4	Practices Human Resource Development	Apply
CO5	Understand about the yoga, life and Law of Nature	Apply

UNIT I YOGA AND PHYSICAL HEALTH 8 HOURS

Manavalakalai (SKY) Yoga: Introduction Education as a means for youth empowerment-Greatress of Education Yoga for youth Empowerment. Simplified Physical Exercises Hand, Leg, Breathing, Eye exercises Kapalabathi, Makarasana Part I, Makarasana Part II, Body Massage, Acupressure, Relaxation exercises Benefits Yogasanas 1: Pranamasana Hastha Uttanasana Pada Hasthasana - AswaSanjalana Asana ThuvipathaasvaSarjalana asana AstangaNamaskara - Bhujangasana Atha Muktha Savasana AswaSanjalanaAsara Pada Hasthasana-Hastha UttanasanaPranamasana - Pranayama: Naddisudei-Clearance Practice-Benefits - Simplified Physical Exercise-Kayakalpa Practices - Meditation Practices.**Philosophy of life:** Purpose of life Philosophy of life (Needs Protections Virtues Development of knowledge) Five Types of duties-Protection of the natural resources

UNIT II GREATNESS OF LIFE FORCE AND MIND 7 HOURS

Reasons for Diseases Natural reasons (Genetic/imprints, Planetary Position, Natural calamities and climatic changes) Unnatural reasons (Food habits, Thoughts, Deeds) Philosophy of Kaya Kalpa: Physical body-Sexual vital fluid-Life force- Bio-Magnetism-Mind Maintaining youthfulness: Postponing old age seven

components - Importance of sexual vital fluid Transformation of food into Measure and method in five aspects of life-Controlling undue Passion.Kayakalpa practice: Aswini Mucra-Ojas breath-Benefits of Kaya Kapa.

UNIT III PERSONALITY DEVELOPMENT – SUBLIMATION 7 HOURS

Mental Frequencies: Beta, Alpha, Theta and Delta wave Agna Meditation explanation benefits. Shanti meditation: Shanthi Meditation explanation-benefits - Thuriya Meditation: Thuriya Meditation explanation-benefits - Benefits of Blessing Self blessing (Auto suggestion) Family blessing Blessing the others World blessing- Divine protection

Human Values: Set-cortio- Sell-confidence Honesty Contentment Humility Modesty To erance Adjustment- Sacrifice-Forgiveness Punty (Bocy, Dress, Enviorment) Physica purity- Mental purity-Spiritualpurity. Social Values: Nonviolence-Service Patriotism-Equality Respect for parents and elders care and protection Respect for teacher Punctuality-Time Management

UNIT IV HUMAN RESOURCE DEVELOPMENT 7 HOURS

Morality (virtues):Importance of Introspection: 1 Mine (Ego, Possessiveness) Six Evi Temperaments-Greed-Anger-Miserliness Immoral sexual passion - Inferionty and superiority Complex - Vengeance Maneuvering of Six Temperaments: Contentment-Tolerance-Charity-Chastity -Equality-Pardon (Forgiveness) - Five essential Qualities acquired through Meditation: Perspicacity Magnanimity Receptivity Adaptability-Creativity (Improved Memory Power)

UNIT V LAW OF NATURE 7 HOURS

Ten stages of the Mind - Five kosas of the mind Maintaining good Relationships Thought- Importance of thoughts - Reasons for Thoughts Practice of Analysis of ThoughtsDefinition of Desire-Root causes for desires Types of desires Desires Essential for success Practice for Moralization of Desires Thought-Reformation-Frugality. Anger- Reasons for Anger-Anger and Peace Ill effects of anger Tolerance and Forgiveness - Neutralization of Anger- practice. Diversity in Men (Why Men Differ) Love and compassion, Eradication of Worries: Reasons for Worries-Fout types of worries Il effects-results-Practice for Eradication of Worries

YOGA PRACTICES: Thandasana Chakrasana (sideways) Vruchasana Thirikonasana Varasana

TOTAL: 36 HOURS

REFERENCE BOOKS:

1. Kayakapam Thathuvagnani Vethathiri Maharishi
2. Light on yoga BKS.lyenger
3. ManavalakalaPart-1-Thathuvagnani Vethathiri Maharishi.
4. Manavalakala part-2-Thathuvagnani Vethathiri Maharishi
5. Mind ThathuvagnariVethathir Maharishi
6. Simplified Physical Exercises- ThathuvagnaniVethathiri Maharishi
7. Sound Health through yoga - Dr.Chandrasekaran
8. The world orcer of Holistic unity- ThathuvagnaniVethathiri Mahanshi
9. Thirukkural-Rev. Dr.G.U.pope
10. Yoga for modern age ThathuvagnaniVethathin Maharishi

SCHEME OF EXAMINATION

INTERNAL EXAMINATION	**100 MARKS**
Theory	40 (Internal Exam as per KAHE Question Pattern)
PRACTICAL	**60 MARKS**
Yoga Practices	50
Viva voce	10

Semester II

24LSUT201 **LANGUAGE – II/ இலக்கிய நெறிகள்** **4H - 3C**

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

End Semester Exam: 3 Hours

PREREQUISITE: Not Required

பாடத்திட்டப் பொதுநோக்கம்

- மாணவர்களுக்குத் தமிழ்மொழி வரலாறு மற்றும் இலக்கியங்களின் வழியாக வாழ்வியல் மதிப்புகளை உணர்த்துதல்.
- சிந்தனைத் திறனையும், படைப்பாக்கத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும் மேம்படுத்துதல்.
- வேலைவாய்புக்குரிய வகையில் மொழித்திறனை மேம்படுத்துதல்.

பாடத்திட்டப் பயன்விளைவு

- தமிழ்மொழி வரலாறு குறித்த தெளிந்த அறிவு பெற்றிருத்தல்.
- வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை பெற்றிருத்தல்.
- படைப்பிலக்கியத்திறன் பெற்றிருத்தல்.
- இந்தியக் குடியுரிமைப்பணி முதலான போட்டித் தேர்வுகளில், விருப்பப்பாடமாக இடம்பெறுகின்ற,'தமிழ் இலக்கியவரலாறு' தமிழ் இலக்கண அறிவு மேம்பாடு பெற்றிருத்தல்.
- மொழிபெயர்ப்பியல், கணினித்தமிழ் சார்ந்த வேலைவாய்ப்புத்திறன் மேம்பாடு.

அலகு – I நாயன்மார்கள் : **(8 மணிநேரம்)**

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 ஆழ்வார்கள் : **(12 மணிநேரம்)**

இலக்கியப் பங்களிப்பு - திவ்யப் பிரபந்தத்தில் பக்திநெறியும் இலக்கிய நயமும்

உரைநடை : தோற்றமும் வளர்ச்சியும்

வைணவம் : பெரியாழ்வார் திருமொழி: 3 -ஆம் பத்து – பத்தாம் திருமொழி 'நெறிந்தகருங்குழல் மடவாய்' – 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. அழுதேங்கிநஞ்சிட்ட,
10. அத்தனை பொத்து.

சிறுகதை : ஆர். சூடாமணி - அந்நியர்கள்

கட்டுரை : ஆளுமைத்திறன் அறிவோம்- தன்னம்பிக்கை மாதஇதழிலிருந்து

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

அலகு - 3 **(10 மணிநேரம்)**

புதுக்கவிதை - தோற்றமும் வளர்ச்சியும்

சிற்றிலக்கியம் -தோற்றமும்வளர்ச்சியும்

மதுரைசொக்கநாதர் - தமிழ்விடுதூது – தமிழின் சிறப்பு பாடியருள பத்துப்பாட்டும் - விளம்பக்கேள்.

கவிதை- ஈரோடுதமிழன்பன் – இன்னொரு சுதந்திரம்

சிறுகதை - கு. அழகிரிசாமி - இருவர் கண்ட ஒரேகனவு

கட்டுரை - ஔவைதுரைசாமி - ஏட்டில் இல்லாத இலக்கியம்

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

அலகு – 4 **(10 மணிநேரம்)**

சிறுகதை - தோற்றமும் வளர்ச்சியும்

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

அருள்தரும் பூங்கோதையன்னை அந்தாதி - 11பாடல்கள் 1. பகவன்பெயரை,

2. மெல்லியல்மேலை, 3.வாலின்குரங்கு, 4.தவளேஇவள், 5.சுரக்கும் திருவருட்,

6. வதிவாய்விளைபயில், 7. உறைவான், 8.பச்சைப்பேர், 9.வித்தகம், 10.துணையாய், 11.கலந்தார்.

கவிதை - கவிஞர்தாமரை - தொலைந்துபோனேன்

சிறுகதை – அம்பை - வல்லூறுகள்

கட்டுரை- முனைவர் ப. தமிழரசி - நொய்யல்,

சொல்லின் செல்வர் ரா.பி.சேதுப்பிள்ளை - காளத்திவேடனும் கங்கைவேடனும்

மொழிபெயர்ப்புப் பயிற்சிகள் : தமிழ்-ஆங்கில மொழிபெயர்ப்புப் பயிற்சிகள் -2.

அலகு – 5 **(8 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.

மொத்த மணிநேரம் 48

பார்வை நூல்கள்

3. **கற்பகச் சோலை – தமிழ்ப்பாட நூல், இலக்கிய நெறிகள்,** தமிழ்த்துறை வெளியீடு, கற்பகம் உயர்கல்விக்கழகம், கோயம்புத்தூர் – 21.
4. **தமிழ் இலக்கிய வரலாறு, முனைவர் கா.கோ. வேங்கடராமன்,** கலையக வெளியீடு, நாமக்கல்.

இணையதளம்

1. www.tvu.org.in
2. www.maduraitamilproject.com

இதழ்கள்

1. **International Research Journal of Indian Literature, irjil.in**
2. **International Tamil Research Journal, iorpress.in**

CO, PO, PSO Mapping

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

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

Semester II

24LUH201 **HINDI-PAPER- II** **4H-3C**

(Modern Poetry, Drama, Novel, Grammar)

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES(CO):

- Understand the text styles and grammatical elements
- Discuss the content of a reading passage
- Develop an interest in the appreciation of short stories

COURSE OUTCOMES(COs) :

- Basic knowledge of Hindi language will be improved.
- Knowledge of glossaries will increase.
- Hindi language expression will rise.
- Learners will enrich their grammar in Hindi.
- The desire to read literature, such as the essay on a poem, develops.

UNIT I a) Poetry – Nagarjun **9 HOURS**

b) Drama -Dhruva Swamini

c) Novel - Nirmala , Thotharam

d) Grammar – Kaal , Theen Prakar

UNIT II a) Poetry – Sita , Ram **9 HOURS**

b) Drama – Mandhakini , Koma

c) Novel – Mansaram , Jiyaram

d) Grammar – Upsarg, Prathyay

UNIT III a) Poetry – Lakshman, Valmiki **10HOURS**

b) Drama – Ramaguptha , Chandhraguptha

c) Novel – Sudha, Bhuvan Mohan Singh

d) Grammar – Sabda Vyutpathi

UNIT IV a) Poetry -Vishvaamithra, Thrijada **10HOURS**

b) Drama –Sikhar Swami,Shakraj

c) Novel – Udhaybanulaal, Siyaram

d) Grammar – Sambandh Chochak

UNIT V a) Poetry – Bhagirath , Sagar **10HOURS**

b) Drama – Khingal , Mihirdev , Prohith

c) Novel – bhalchandra Sinha,Kalyani, Rangili Bai

d) Samuchchaybodhak, Vishmayathibodhak

TOTAL: 48 HOURS

REFERENC BOOKS:

1. Modern Poetry : Bhoomija
2. Writer : Nagarjun

   Editors : Somdev & shobhakanth

   Publisher : Rdha Krishna Publication New Delhi - 110051

3. Drama : Dhruva Swamini
4. Writer : Jaysankar Prasad
   a. Publisher : Sakshi Publication S 16,Naveen Shahdhara Delhi – 110032
5. Novel : Nirmala
   a. Writer : Premchandh
6. Publisher : Prabhath Prakashan 4/19 Asaf Ali Road New Delhi – 110002

7. Grammar : Sugam Hindi Vyakaran
8. Writer : Pro. Vamsidhar & Dharmapal
9. Publisher : Siksha Bharathi Madharsa Road New Delhi – 110006.

CO, PO, PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO 1	PSO2
CO1	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	**3**	**2.4**	**2.4**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

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

Semester II

24LUM201 MALAYALAM II 4H-3C

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not required

COURSE OBJECTIVE(CO):

- A basic understanding of contemporary poetry can be gained and the nature of modern poetry can be realized.
- Realizing the nature of drama and its nature and improving the knowledge of reading and understanding the nature of contemporary plays.
- Understands the benefits of correspondence and can enhance the correspondence you need.

COURSE OUTCOME(COs):

- Get a basic understanding of Memories
- It will create basic knowledge about Environmental Psychology.
- It will create awareness about our environment.
- Knowledge is gain about our country, culture etc.
- It will be an eye opener to the students towards our Mother Earth.

	PART I – MALAYALAM II	
Unit No.		**Hours**
I	Novel -Enmakaje	**10**
II	Novel – Enmakaje	**10**
III	Memmories – Neermaathalam Pootthakaalam	**10**
IV	Memmories – Neermaathalam Pootthakaalam	**9**
V	Translation(English to Malayalam)	**9**
	TOTAL	**48**

TEXT BOOKS:

1.Emakaje – AmbikasuthanMangad – DC Books Kottayam,Kerala

2.NeermaathalamPootthakaalam - Madhavikutty -DC Books Kottayam, Kerala

REFERENCE BOOKS:

1. Athmakathasahithyam Malayalathil-Dr.Vijayalam Jayakumar (N.B.S.Kottayam) Malayala Novel SahithyaCharitram-K.M.Tharakan (N.B.S.Kottayam) SahithyaCharitramPrasthanangalilude- Dr.K.M George,
2. (D.C.Books Kottayam)
3. MalayalaSahithyavimarsam-Sukumar Azheekode (D.C.books)

CO, PO, PSO Mapping

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

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

Semester II

24LUS201 **SANSKRIT II** **4H-3C**

(PROSE, GRAMMAR AND TRANSLATION**)**

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not required

COURSE OBJECTIVES(CO):

- The fundamental objective of the curriculum is to impart effective science education at the undergraduate level, exposing them to recent trends and developments in the subject.
- Creating scientific temper is another major objective of this curriculum.
- Another major thrust given here is to develop an environmental concern in all activities ofthe students. 'Go green', the motto of the syllabus emphasizes the urgent need to conserve nature without destruction of natural resources.

COURSE OUTCOMES(COs) :

- **Critical Thinking** :Take informed actions after identifying the assumptions that frame students' thinking and actions.
- **Problem Solving**: Understand and solve problems of relevance to society to meet the specified needs using the knowledge, skills and attitudes acquired.
- **Effective Communication**: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.
- **Effective Citizenship**: Demonstrate empathetic social concern and equity centered national development.
- **Environment and Sustainability**: Understand the issues of environmental contexts and sustainable development.

UNIT I **9 HOURS**

Introduction to Sanskrit Prose, Important prose works in Sanskrit

UNIT II **9 HOURS**

Balaramayana – Balakanda

UNIT III **10 HOURS**

Balaramayana – Ayodhyakanda

UNIT IV **10 HOURS**

Balaramayana – Aranyakanda

UNIT V **10 HOURS**

Athmanepada Declension of ending nouns (feminine)

Passages from Sanskrit Self Teacher (Simple sentences)

TOTAL: 48 HOURS

TEXT BOOK:

1. Balaramayana – a simple prose version.R.S. Vadhyar and sons,Palghat, Kerala.

CO, PO, PSO Mapping

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

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

Semester II

24LUF201 **FRENCH II** **4H-3C**

(Leçon, Communication, Grammaire, Verbes, Lexique, Culture)

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

The objectives of this course are:

- To make the students to speak and write errors free French.
- To help the students develop their listening, speaking, reading and writing skills.
- Introducing literary works to the students to enhance their analytical and aesthetic skills.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	strengthen the foundation of the language.	Remember
CO2	standardize and demonstrate understanding of LSRW skills.	Understand
CO3	utilize fundamentals of language for reading, writing and effective communication.	Apply
CO4	enhancing the reading skill to build the leadership quality.	Apply
CO5	Develop the moral and aesthetic values.	Evaluate

UNITÉ I a) Leçon - Les loisirs **9 HOURS**

b) Communication - Parler de ses goûts et de ses préférences

c) Grammaire - Les adjectifs interrogatifs , Les nombres ordinaux, L'heure, Les pronoms personnels COD

d) Verbes -savoir et connaitre

e) Lexique - Les loisirs, Les activités quotidiennes ,Les matières

f) Culture - les grands fleuves de france.

UNITÉ II a) Leçon - La routine **9HOURS**

	b) Communication	- Décrire sa journée	
	c) Grammaire	- Les verbes pronominaux, Les verbes du premier groupe en -e_er, -é_er, -eler, -eter, Le verbe prendre	
	d) Verbes	- manger, boire	
	e) Lexique	- Le temps et l'heure ,La fréquence	
	f) Culture	- les bandes dessinees.	
UNITÉ III	a) Leçon	-Où faire ses courses	**10 HOURS**
	b) Communication	- Au restaurant : commander et commenter	
	c) Grammaire	- Les articles partitifs, Le pronom en (la quantité) très ou beaucoup ? La phrase négative	
	d) Verbes	- les verbs irregulliers	
	e) Lexique	- Les aliments, Les quantités, Les commerces et les commerçants	
	f) Culture	-Les plats francais	
UNITÉ IV	a) Leçon	- Decourvez et dégustez	**10 HOURS**
	b) Communication	- Inviter et répondre ,à une invitation	
	c) Grammaire	- L'impératif ,Il faut, c'est/ il est,future proche	
	d) Verbes	- Les verbes devoir, pouvoir, savoir, vouloir	
	e) Lexique	- Demander et dire le prix, Les services, Les moyens de paiement	
	f) Culture	- Le festival du mot	
UNITÉ V	a) Leçon	- Tout le monde s'amuse, Les ados au quotidien	**10 HOURS**
	b) Communication	- Décrire une tenue , Écrire un message amical	
	c) Grammaire	-Les adjectifs demonstratives, La formation du féminin Le pronom indéfini on, passé compose'.	
	d) Verbes	- Les verbes du premier groupe en –yer, Les verbesvoir et sortir	
	e) Lexique	- Les sorties Situer dansle temps, La famille ,(2) Lesêtements etles accessoires	

f) Culture - Le pays des gourmands

TOTAL: 48 HOURS

REFERENCE BOOKS:

1. Cocton Marie –Noëlle , Duplex Dorothée, Heu Elodie , Kasazian Emilie, Ripaud Delphine, **Saison 1- Méthode de francais,** Didier, paris.2015.
2. Cocton Marie – Noëlle, Dupleix, Heu Elodie, Kasazian Emilie ,Ripaud Deldphin, **Saison 1 – Cahier d'activites ,** Dider ,Paris , 2015
3. Anne Akyüz,Bernadette Bazelle- Shahmael,JoëlleBonenfant, Marie- Françoise Gliemenn,**Les exercices de grammaire,**Hachette FLE, Paris,2005
4. Christian Beaulieu, Je **pratique, Exercises de grammaire A1,** Dider,Paris,2015
5. Nathalie BIE, philippe SANTINAN,**Grammaire pour adolescents-250 exercises,** CLE International , Paris , 2005

WEBSITES :

1. http:// enseigner.tv5 monde.com/
2. bonjourdumonde.com /exercises/contenu/le – francais-du- tourisme.html
3. http://www.bonjurdefrance.com/
4. https://www.lepointdufle.net/

CO, PO, PSO Mapping

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

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

Semester II

24ENU201 ENGLISH - II 3H - 3C

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not required

COURSE OBJECTIVES(CO):

- To make the students to speak and write errors free English.
- To help the students develop their listening, speaking, reading and writing skills.
- Introducing literary works to the students to enhance their analytical and aesthetic skills.

Course Outcomes (COs):

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

COs	Course Outcomes	Blooms Level
CO1	strengthen the foundation of the language.	Remember
CO2	standardize and demonstrate understanding of LSRW skills.	Understand
CO3	utilize fundamentals of language for reading, writing and effective communication.	Apply
CO4	enhancing the reading skill to build the leadership quality.	Apply
CO5	Develop the moral and aesthetic values.	Evaluate

UNIT I **8 HOURS**

LISTENING : Listening for Pleasure
SPEAKING : Developing speaking skills
READING : Reading strategies
WRITING : Developing a story with pictures
LITERATURE: Refuge Mother and Child by Chinua Achebe (Poetry)
GRAMMAR : Voice

UNIT II **7 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 (Story)
GRAMMAR : Subject, verb, agreement

UNIT III **7 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 **7 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 **7 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

TOTAL: 36 HOURS

TEXT BOOK

1. Board of Editors (2024), Acrostic II. Karpagam Academy of Higher Education

REFERENCE BOOKS:

1. *Martin's, St* (2013). *Oxford Handbook of Writing: Handbook of Writing.* Cambridge University Press.
2. Julian Treasure, *Sound Business*, (2012). Oxford University Press
3. Hornby, A,S.(1975). *The Guide to patterns and usage in English*: oxford university Press.
4. Ellis, R. (1990). *Instructed second language acquisition*. Oxford: oxford university Press.

WEB SITES:

1. https://shortstoryproject.com/stories/the-postmaster/
2. https://www.gradesaver.com/rabindranath-tagore-short-stories/study-guide/summary-the-postmaster

CO, PO, PSO Mapping

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

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

Semester II

24ADU201 OBJECT ORIENTED PROGRAMMING 4H - 4C

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not Applicable

COURSE OBJECTIVES (CO):

The goal of this course is for students to:

- To objective of this course is to provide the student with the fundamental knowledge and skills to become a proficient C++ programmer.
- To learn to transpose the physical problem domain into a hierarchy of objects.
- To understand the basics of AWT and other available packages and able to accomplish real world task in an easier way.

COURSE OUTCOMES (COs)

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

COs	Course Outcomes	Blooms Level
CO1	Classify the difference between top-down and bottom-up approach.	Understand
CO2	Apply the concepts of object-oriented programming in constructor and destructor.	Apply
CO3	Apply the major object-oriented concepts to implement inheritance and polymorphism.	Apply
CO4	Analyze the basics of Java and can develop java desktop application.	Analyze
CO5	Discover Java applications using AWT and other packages	Analyze

UNIT I INTRODUCTION TO OBJECT ORIENTED PROGRAMMING 10 HOURS

Object Oriented Paradigm – Structured Programming Versus Object Oriented Development – Basic Concepts - Arrays and Strings – Functions – Inline Functions – Functions with Default Arguments – References - Classes and Objects – Constructors – Destructors - Array of Objects - Pointers to Objects – ‘this’ Pointer - Dynamic Allocation Operators - Dynamic Objects - Static Data Members and Static Objects – Objects as Arguments – Returning Objects – Friend Function and Friend Class.

UNIT II CLASSES AND OBJECTS 8 HOURS

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 TEMPLATES AND FILES **10 HOURS**

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 – String Class.

UNIT IV JAVA BASICS **10 HOURS**

Overview of Java - Java Features – comparison of Java with C and C++ - Java and Internet – Java Environment – Java Program structure – Java Tokens – Implementing a Java Program – Java Virtual Machine. **Constants, Variables, Data Types:** Constants – Variables – Data types – Declaration of variable – Scope of Variables. **Class, Objects and Methods:** Defining a Class – Field Declaration – Method Declaration – Creating Objects -Accessing Class Members – Constructor - Method Overloading – Overriding Methods. Inheritance – **Interfaces:** Multiple Inheritance.

UNIT V PACKAGES AND AWT **10 HOURS**

Package Putting Class Together: Java API Packages – Naming, Creating, Accessing and Using a Package – Adding a Class to a Package. **Multithreaded Programming**: Creating, Extending the Thread Class – Life Cycle of Thread – Managing Errors and Exception

Applet Programming: Difference between Application and Applets – Applet Life cycle – creating an Executable Applet – Designing a Web Page – Adding Applet to HTML File – Passing Parameters to Applets.

TOTAL: 48 HOURS

TEXT BOOKS:

1. E.Balagurusamy " *Object Oriented Programming with C++",* TMH 2/e
2. *Mastering C++* A.R.Venugopal, Rajkumar, T. Ravishanker, TMH
3. E. Balagurusamy, "*Programming with Java – A primer*", Second Edition, Tata McGraw Hill Publishing Company, Delhi, 2002.

REFERENCE BOOKS:

1. Stefan Bjornander, 2016. *C++ Windows Programming*, Published by Packt Publishing Ltd.
2. Herbert Schildt, "*The complete Reference – Java 2*", Fifth Edition, Tata McGraw Hill Publishing Company, Delhi, 2002.

WEBSITES:

1. www.programmingsimplified.com
2. https://nptel.ac.in/courses/106/105/106105171
3. www.programiz.com/cpp-programming
4. www.cplusplus.com

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO4	PO 5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PO1 3	PO1 4	PO1 5	PSO1	PSO2
CO1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	2
CO2	-	-	-	3	2	-	-	-	-	-	-	-	-	-	-	2	-
CO3	-	-	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	-	-	3	-	2	2	-	-	-	-	-	-	-	-	-	-
CO5	2	-	-	3	-	2	2	-	-	-	-	-	-	-	-	-	-
Average	2	-	-	3	2	2	2	-	-	-	-	-	-	-	-	2	2

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

Semester II

24ADUA201 DISCRETE STRUCTURES 4H - 3C

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

End Semester Exam: 3 Hours

PREREQUISITE:

Understanding of basic algebra and calculus.

COURSE OBJECTIVES (CO):

- To learn the basic concepts of logical connectives, sets, functions, and relations.
- To understand permutation and combination, mathematical induction, and linear difference equations.
- To know the fundamental definitions and concepts of graph theory, including paths, circuits, and trees.

COURSE OUTCOMES(COs):

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

COs	Course Outcomes	Blooms Level
CO1	Interpret logical connectives and truth tables in well-formed formulas.	Understand
CO2	Explain the basic concepts of set theory and operations on sets.	Understand
CO3	Apply permutation and combination techniques to solve counting problems.	Apply
CO4	Solve linear recurrence relations using the characteristic root method and generating functions.	Apply
CO5	Define basic terminology and concepts in graph theory.	Understand

UNIT I PREPOSITIONAL LOGIC 12 HOURS

Prepositions - 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 SETS 12 HOURS

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 COMBINATORICS 12 HOURS

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

UNIT IV RECURRENCES **12 HOURS**

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

UNIT V GRAPH THEORY **12 HOURS**

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).

TOTAL: 48 HOURS

TEXT BOOKS:

1. Tremblay, J. P. and Manohar, R. (2008). *Discrete Mathematical Structures with Applications to Computer Science* (1st ed.), McGraw-Hill Book Company, New Delhi.
2. Kenneth Rosen, (2019). *Discrete Mathematics and Its Applications* (8th Ed.), McGraw Hill Company, New Delhi.

REFERENCE BOOKS:

1. Sharma, J. K. (2011). *Discrete Mathematics* (Third Edition), Rajiv Beri for Macmillan Publishers India Ltd. New Delhi.
2. Singaravelu, A. and Jeyaraman M.P. (2019). *Discrete Mathematics*, Meenakshi Agency Chennai.
3. Hunter, D.J. (2016). *Essentials of Discrete Mathematics* (3rd Ed.), Jones and Bartlett Publishers, New Delhi.
4. 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=xlUFkMKSB3Y&list=PL0862D1A947252D20.

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	-	-	1	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	**-**	**-**	**1.3**	**2.4**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

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

Semester II

24ADU202 DESIGN THINKING 4H - 2C

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES :(COs)

- Understand the fundamental concepts and origins of design thinking.
- Recognize the importance and impact of design thinking in various fields.
- Differentiate between traditional design and design thinking.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Articulate the definition, origin, and importance of design thinking.	Understand
CO2	Identify and overcome challenges in the idea generation process.	Understand
CO3	Demonstrate an ability to understand and empathize with user needs and experiences.	Apply
CO4	Develop prototypes with a clear understanding of the prototyping mindset.	Apply
CO5	Prepare and execute effective testing phases for both digital and physical prototypes.	Analyze

UNIT I INTRODUCTION TO DESIGN THINKING 10 HOURS

Definition, Origin of design thinking, Importance of design thinking, Design vs Design thinking, Understanding design thinking and its process model, Design thinking tools. Types of the thinking process.

UNIT I: EMPATHIZE: **10 HOURS**

Design thinking phases, how to empathize, Role of empathy in design thinking, Understanding empathy tools: Customer Journey Map, Personas.

UNIT III IDEATION 10 HOURS

Challenges in idea generation, need for systematic method to connect to user, Visualize, Empathize, and Ideate method, Importance of visualizing and empathizing before ideating,

UNIT IV PROTOTYPING 10 HOURS

What is a prototype? - Prototyping as a mindset, prototype examples, prototyping for products. Process of prototyping- Minimum Viable prototype

UNIT V TESTING PROTOTYPES **8 HOURS**

Prototyping for digital products: What unique for digital, Preparation; Prototyping for physical products: What_s unique for physical products, Preparation.

TOTAL: 48 HOURS

TEXTBOOKS:

1. Hanan, S. S., Kumar, S. S., & Sam, D. P. (2019). *Introduction to Design Thinking*. Tata McGraw Hill.

2. McElroy, K. (2017). *Prototyping for Designers: Developing the Best Digital and Physical Products*. O'Reilly.

REFERENCE BOOKS:

1. Luchs, M. G., Swan, S., & Griffin, A. (2015). *Design Thinking – New Product Essentials from PDMA*. Wiley.

2. Kumar, V. (2012). *101 Design Methods: A Structured Approach for Driving Innovation in Your Organization*. Wiley.

WEBSITES:

1. https://www.interaction-design.org/literature/article/5-stages-in-the- designthinking-process

2. https://www.ibm.com/design/thinking/page/toolkit

3. https://www.interaction-design.org/literature/article/define-and-frame-your- designchallenge-by-creating-your-point-of-view-and-ask-how-might-we

CO, PO, PSO Mapping

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

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

Semester II

24ADU203 COMMUNITY ENGAGEMENT AND SOCIAL RESPONSIBILITY **2H -2C**

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

End Semester Exam: 3 Hours

PRE-REQUISITE:

Not required

COURSE OBJECTIVES (CO):

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

COURSE OUTCOMES (COs):

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

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

UNIT I INTRODUCTION AND PRINCIPLES **8 HOURS**

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

UNIT II RURAL DEVELOPMENT **8 HOURS**

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

UNIT III COMMUNITY AND RESEARCH **8 HOURS**

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

TOTAL: 24 HOURS

TEXT BOOK:

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

WEBSITES:

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

CO, PO, PSO Mapping

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

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

Semester II

24ADU211 OBJECT ORIENTED PROGRAMMING - PRACTICAL 4H - 2C

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

End Semester Exam: 3 Hours

PREREQUISITE:

- Student should Studied c programming language.

COURSE OBJECTIVES (COs):

- 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.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	interpret 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	infer with multithreading, exception handling mechanism and collections.	Understand
CO4	Demonstrate constructors and method overloading using classes and objects.	Apply
CO5	Relate the exception handling mechanisms and multithreaded model to solve real world problems	Apply

LIST OF PROGRAMS:

1. Write a C++ program to print sum of digits.
2. Write a C++ program to check palindrome number.
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. Implement array using pointers.
6. Write a program which takes the radius of a circle as input from the user, passes it to another function that computes the area and the circumference of the circle and displays the value of area and circumference from the main() function.

7. Create the Person class. Create some objects of this class (by taking information from the user). Inherit the class Person to create two classes Teacher and Student class. Maintain the respective information in the classes and create, display and delete objects of these two classes (Use Runtime Polymorphism).
8. Write a program to demonstrate the try, catch block in C++
9. Write a C program to count the number of lines, words and characters in a given text.
10. Write a C++ program that uses a single file for both reading and writing the data.

TOTAL:48 HOURS

TEXT BOOKS:

1. Mallia, A., & Zoffoli, F. (2019). *C++ Fundamentals*. Packt Publishing Ltd.
2. Murach, J., & Delamater, M. (2018). *C++ Programming*. Mike Murach & Associates Inc.
3. Stroustrup, B. (2014). *Programming: Principles and Practice using C++* (2nd ed.). Addison-Wesley.
4. Bjornander, S. (2016). *C++ Windows Programming*. Packt Publishing Ltd.

REFERENCE BOOKS:

1. Stegman, R. L. (2016). *Focus on Object-Oriented Programming with C++* (6th ed.). CreateSpace Independent Publishing Platform.
2. Chaudhary, H. H. (2014). *Head First C++ Programming: The Definitive Beginner's Guide*. First CreateSpace Inc, O-D Publishing LLC USA.
3. Jana, D. (2014). *C++ and Object-Oriented Programming Paradigm*. PHI Learning Pvt. Ltd.

WEBSITES:

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

CO, PO, PSO Mapping

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

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

Semester II

24SEC211 WEB PROGRAMMING- PRACTICAL 3H- 2C

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

End Semester Exam: 3 Hours

PREREQUISITE:

- Student should Know HTML basics

COURSE OBJECTIVES (COs):

- 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.

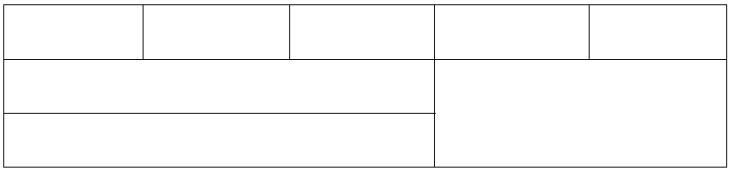
COURSE OUTCOMES (COs):

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

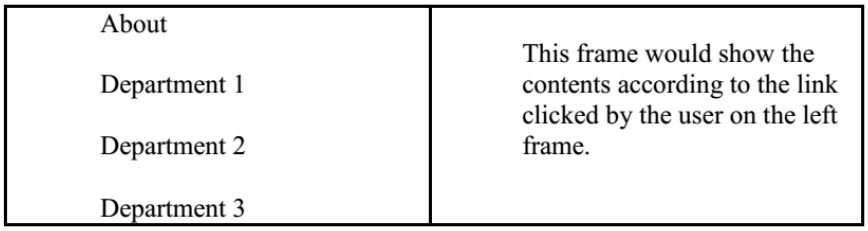
COs	Course Outcomes	Blooms Level
CO1	Classify the fundamentals of Internet and the Web concepts	Understand
CO2	Compare the various component of web concepts	Understand
CO3	illustrate the usage of internet concepts and analyze its components.	Analyze
CO4	Discover and apply the online information resources	Apply
CO5	Take Apart and utilize the appropriate Google Apps for education effectively	Analyze

LIST OF PROGRAMS:

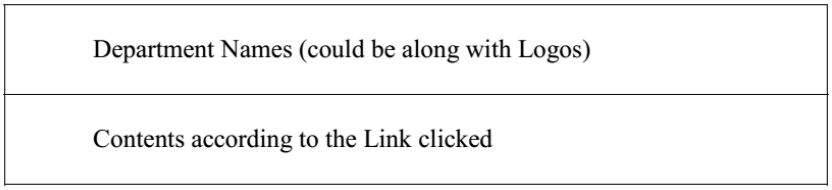
1. To create a webpage using following formatting–Bold, Italics, Underline, Colors, Headings, Title, Font and Font Width, Background, Paragraph, Line Breaks, Horizontal Line, Blinking text as well as marquee text.
2. To create a webpage using Ordered Lists, Unordered Lists, Inserting images, Internal and External Links.
3. To create a Table using HTML.



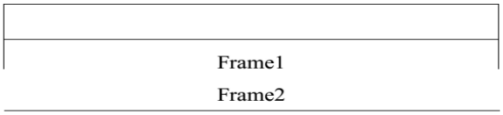
4. To create a webpage using input type, select and Text Area in HTML.
5. To create a HTML Form containing RollNo, name of the student and Grades in a tabular form.
6. To create a webpage using Frames in HTML.

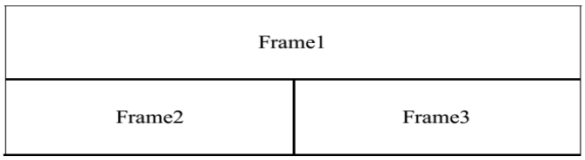


7. To create a webpage using Horizontal Frames in HTML.



8. To create a webpage using Inline Cascading Style Sheet.
9. To create a webpage using Internal/ Embedded Style Sheet.





10. To create a webpage using External Style Sheet.
    a. Text Box
    b. Option/radio buttons
    c. Check boxes
    d. Reset and Submit button

List of Programs using JavaScript: Create event driven program for following

11. To write JavaScript program to compute squaresandcubesofnumbersfrom5to15.
12. To write JavaScript program to find the largest of three numbers.
13. To write JavaScript program to find the factorial of a number.
14. To write JavaScript program to calculate sum and average of numbers.
15. To write JavaScript program to count the number of negative numbers, positive numbers and zeros in the list.
16. To write JavaScript program to prompt username and display it.

TOTAL: 36 HOURS

TEXTBOOK:

1. Sklar, J. (2015). *Principles of Web Design* (6th ed.).

2. McFedries, P. (2018). *Web Coding & Development All-in-One for Dummies*.

3. Connolly, R., & Hoar, R. (2017). *Fundamentals of Web Development*.

REFERENCE BOOKS:

1. Powell, T. A., & Schneider, F. (2013). *JavaScript: The Complete Reference* (3rd ed.). Tata McGraw Hill.

2. Duckett, J. (2014). *HTML and CSS: Design and Build Websites*.

WEBSITES :

1 https://developer.mozilla.org/enUS/docs/Web/JavaScript/Guide.

2 https://www.youtube.com/watch?v=PKuBtQuFa-8

3 https://www.youtube.com/watch?v=hGER1hP58ZE

4 http://www. freeCodeCamp Guides.com/

5 http://www. Codrops CSS Reference/

CO, PO, PSO Mapping

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

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

Semester II

24VAC201 ENVIRONMENTAL STUDIES 2H - 2C

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

End Semester Exam: 3 Hours

PREREQUISITE: Student should know about fundamentals of environment.

COURSE OBJECTIVES (CO):

- To create awareness about structure and functions of various ecosystems.
- To develop an attitude of concern for the natural resources availability and its environment protection.
- To learn about the environment, resources available, biodiversity and its conservation.
- To understand the current scenarios- to find ways for protection and betterment of or habitat.
- To understand the concepts to analyze the interactions between social and environmental problems.

COURSE OUTCOMES (COs):

On completion of the course, students are able to

COs	Course Outcomes	Blooms Level
CO1	Define the structure and functions of various ecosystems	Remember
CO2	Learn the ethical, cross-cultural, and historical context of natural resources and the methods for conservation	Understand
CO3	Predict current scenarios and find ways for the protection and betterment of habitat	Analyze
CO4	Analyze the interactions between social and environmental problems	Apply
CO5	Develop systems concepts and methodologies to analyze and understand interactions between social and Environmental processes	Create

UNIT I INTRODUCTION - ENVIRONMENTAL STUDIES & ECOSYSTEMS: 5 HOURS

Environment Definition, Scope and Importance; Ecosystem, Structure, classification, and functions of ecosystem. Energy flow, Food chains and food webs, Ecological succession. Forest ecosystem, Grassland Ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

UNIT II NATURAL RESOURCES - RENEWABLE AND NON-RENEWABLE RESOURCES: 5 HOURS

Natural resources - Renewable and Non–renewable resources. Land resources, Land degradation, desertification. Forest resources – Deforestation: Causes and impacts due to mining. Water resources- Use and over-exploitation of surface and groundwater.

UNIT III BIODIVERSITY AND ITS CONSERVATION: 5 HOURS

Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity. Values of Biodiversity - Ecological, economic, social, ethical, aesthetic value. Bio-geographical classification of India. Hot-spots of biodiversity. Endangered and endemic species of India. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.

UNIT IV ENVIRONMENTAL POLLUTION: 4 HOURS

Definition, causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution. Nuclear hazards and human health risks.

UNIT V SOCIAL ISSUES AND THE ENVIRONMENT: 5 HOURS

Concept of sustainability and sustainable development. Climate change, global warming, ozone layer depletion, acid rain and its impacts on human communities and agriculture. Environment Laws (Environment Protection Act, Air Act, Water Act, Wildlife Protection Act, Forest Conservation Act).

TOTAL: 24 HOURS

TEXT BOOKS:

1. Anonymous. 2004. *A Text book for Environmental Studies, University Grants Commission and Bharat Vidypeeth Institute of Environmental Education Research*, New Delhi.
2. Anubha Kaushik., and Kaushik, C.P.(2008). *Perspectives in Environmental Studies*, 3rd Edition, New Age International Pvt. Ltd. Publications, New Delhi.
3. Arvind Kumar,(2009). *A Textbook of Environmental Science*, APH Publishing Corporation, New Delhi.
4. Mishra, D.D,(2010). *Fundamental Concepts in Environmental Studies*. S. Chand & Company Pvt. Ltd., New Delhi.
5. Odum, E.P., Odum, H.T. and Andrews, J. (1971*). Fundamentals of Ecology*, Philadelphia: Saunders.
6. Sing, J.S., Sing. S.P. and Gupta, S.R.(2014). *Ecology, Environmental Science and Conservation*, S. Chand & Publishing Company, New Delhi.
7. Tripathy. S.N., and Sunakar Panda. (2011). *Fundamentals of Environmental Studies*, 3rd Edition, Vrianda Publications Private Ltd, New Delhi.
8. Uberoi, N.K. (2010). *Environmental Studies*, 2nd Edition, Excel Books Publications, New Delhi.

REFERENCE BOOKS:

1. Botkin., and Keller, (2014). *Environmental Science: Earth as a Living Planet*. 9th Edition, Wiley
2. Rajagopalan, R. (2016). *Environmental Studies: From Crisis to Cure*, Oxford University Press.
3. Singh, M.P., Singh, B.S., and Soma, S. Dey,(2004). *Conservation of Biodiversity and Natural Resources*, Daya Publishing House, New Delhi.
4. Verma, P.S., and Agarwal V.K(2016). *Environmental Biology (Principles of Ecology).* S. Chand and Company Ltd, New Delhi.
5. Bruce Rittmann and Perry Mc Carty, *Environmental Biotechnology: Principles and Applications*,(2020). 2nd Edition.

CO, PO, PSO Mapping

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

1-Low; 2-Medium; 3-Strong; '-' No correlation

Semester III

24LSUT301 **LANGUAGE – III/ தமிழ் இலக்கிய வரலாறு** **4H - 3C**

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

பாடத்திட்டப் பொதுநோக்கம்

- தமிழ் மொழியின் சிறப்புகளை அறியச் செய்தல்.
- முச்சங்கங்கள் சங்ககால இலக்கண நூல்கள் பற்றித் தெரிந்து கொள்ளுதல்.
- பல்வேறு சமயம் சார்ந்த இலக்கியங்களை ஒப்பீடு செய்தல்,தொன்ம இலக்கியங்களை அறியச் செய்தல்

பாடத்திட்டப் பயன்விளைவு

- சங்க இலக்கிய மேன்மைகள்- திணைக்கோட்பாடுகள் அறிவு பெற்றிருத்தல்.
- வேற்றுமொழிப் படையெடுப்புகளுக்குஈடுகொடுத்து நிற்கும்திறன் குறித்து அறிதல்.
- ஐம்பெருங்காப்பியங்கள் ஐஞ்சிறுகாப்பியங்களின் சிறப்பை உணர்தல்.
- பிற அறநூல்களின் கருத்துக்களைத் தெரிந்து கொள்ளுதல்.
- செம்மொழியின் சிறப்பையும், தொன்மையையும் அறிதல்.

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 (8 மணிநேரம்)

தமிழின் எழுத்து – சொல் – பொருள் – யாப்பு - அணி இலக்கணச் சிந்தனைகள் .

பாடநூல்:

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

மொத்த மணிநேரம் 48

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.

இணையதளம்

1. www.tvu.org.in
2. www.maduraitamilproject.com

இதழ்கள்

1. International Research Journal of Indian Literature, irjil.in
2. International Tamil Research Journal, iorpress.in

CO, PO, PSO Mapping

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

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

Semester III

24LUH301 HINDI-PAPER- III 4H-3C

(Story, History of Hindi Literature, Novel, Letter Writing

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES(CO):

- Knowledge of contemporary drama contents of Hindi literature
- Learn novels and its techniques. The ability to read novels and express criticism about it and the ability to express social thoughts will improve
- There will also be litigation messages in Hindi and news on speech techniques

COURSE OUTCOMES(COs):

- Develop an interest in the appreciation of literature.
- Discuss and respond to content of a reading passage.
- Learning the literacy knowledge of Hindi specially reading and writing .
- Learning the literary knowledge specially reading and understanding of Hindi short Stories
- Learning the history of Hindi literature

UNIT I a) Story – Bade Ghar Ki Beti **9 HOURS**

b) Hindi Bhasha Ka Vikas

c) Novel – Ramnath,Jalpa

d) Letter Writing –Personal Letter

UNIT II a) Story – Puraskar **9 HOURS**

b) Kaal Vibhajan , Char Prakar

c) Ramesh Babu ,Devdeen

d) Letter Writing – Leave Letter

UNIT III a) Story – Usne Kaha Tha **10 HOURS**

b) Literature – Adhikaal

c) Indhubhooshan, Rathna,Johra

d) Letter Writing – Letter for the Publisher

UNIT IV a) Story – Paanchminte **10 HOURS**

b) Poorva Madhya Kaal

c) Manibhooshan,Dhayanath,Rameshwari

d) Letter Writing – Application for job

UNIT V a) Story – kafan **10 HOURS**

b) Reethi Kaal,Adhunik Kaal

c) Dheen Dhayal,Manaki,

d) Letter Writing – Complaint Letter

TOTAL: 48 HOURS

REFERENCE BOOKS

1.Story : Kahani Manjari

Publisher : D.B.Hindi Prachar Sabha

T.Nagar , Chennai – 600017

2.History of Hindi

Literature : Hindi Sahithya ka Saral Ithihas

Writer : Rajnath Sharma.A

Publisher : Vinoth Pusthak Mandir

Aagra – 02

3.Novel : Gaban

Writer : Premchandh

Publisher : Rajkamal Prakashan

New Delhi – 110002

4.Letter Writing : Sumitha Hindi Nibandh Aur Pathra Lekhan

Writer : Sri Sharan

Publisher : Kalda Publication

Mukhar Ji Nagar, Delhi - 09

CO, PO, PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	2	3	3	-	-	-	-	-	-	-	-	-	-	-		-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-	-	-		-	-
CO3	2	2	3	-	-	-	-	-	-	-	-	-	-	-		-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-	-	-		-	-
CO5	3	2	3	-	-	-	-	-	-	-	-	-	-	-		-	-
Average	**2.6**	**2.6**	**2.8**	**-**	**-**	**-**	**-**	**-**	-	-	-	-	-	-		-	-

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

Semester III

24LUM301 MALAYALAM III 4H-3C

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

PREREQUISITE:

Not required

COURSE OBJECTIVE(CO):

- May have knowledge of the contents of primitive poetryLearn about contemporary poetry and its techniques.
- Interest in reading poetry and the ability to express social thoughts will improve
- This will help you to understand the basics of Malayalam Poetry and to understand Malayalamliterature properly

COURSE OUTCOME(COs):

- Get a basic knowledge of the history of Malayalam literature.
- Enhances the art and taste of Malayalam literary works
- Literary genres can be learned
- Create more to read and enjoy Malayalam poetry
- Get the basic Knowledge of poetry techniques

Unit No	PART I – MALAYALAM III	Hours
I	Poetry – Chinthavishtayaya Seetha	10
II	Poetry – Chinthavishtayaya Seetha	10
III	Poetry – Mrugasikshakan-(Murgasikshakan,Kausalya,Varavu,Vittupoku Ekalavyan,Mazha) 6 poetries	10
IV	Poetry – Mrugasikshakan-(Kayal,Karkkadakam,Bhagavatham,Vazhivakkilenaikutty,Edavelayil oru nimisham,Verumoru kathu) 6 poetries	09
V	Poetry - Aayisha	09
	TOTAL	48

TEXT BOOKS:

1. Chinthavishtayaya Seetha –Kumaranasan,Kerala Book Store Publishers.
2. Mrugasikshakan – Vijayalakshmi,DC Books, Kottayam
3. Aayisha – VayalarRamavarma - Kerala Book Store Publishers

REFERENCE BOOKS:

1. Kavitha SahithyaCharitram-Dr.M.Leelavathi (Kerala SahithyaAcademy,Trichur)
2. Kavitha Dwani-Dr.M.Leelavathi (D.C.Books, Kottayam)
3. Aadhunika SahithyacharithramPrasthanangalilude-Dr.K.M.George (D.C.Books, Kottayam)

4. Padya SahithyaCharithram – T.M.Chummar (Kerala SahithyaAcademy,Trichur)

CO, PO, PSO Mapping

CO	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO1 1	PO12	PO1 3	PO1 4	PO1 5	PSO1	PSO2
CO1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	3	2.5	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-

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

Semester III

24LUS301	**SANSKRIT III** (Drama and History of Sanskrit Literature)	**4H-3C**

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not required

COURSE OBJECTIVES(CO):

- The fundamental objective of the curriculum is to impart effective science education at the undergraduate level, exposing them to recent trends and developments in the subject.
- Creating scientific temper is another major objective of this curriculum.
- Another major thrust given here is to develop an environmental concern in all activities ofthe students. 'Go green', the motto of the syllabus emphasizes the urgent need to conserve nature without destruction of natural resources.

COURSE OUTCOMES(COs) :

- **Critical Thinking** :Take informed actions after identifying the assumptions that frame students' thinking and actions.
- **Problem Solving**: Understand and solve problems of relevance to society to meet the specified needs using the knowledge, skills and attitudes acquired.
- **Effective Communication**: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.
- **Effective Citizenship**: Demonstrate empathetic social concern and equity centered national development.
- **Environment and Sustainability**: Understand the issues of environmental contexts and sustainable development.

UNIT I **9 HOURS**

History of Sanskrit Drama and its origin.

UNIT II **9 HOURS**

Important Sanskrit Dramas and important authors.

UNIT III **10 HOURS**

Text Prescribed: "Dutavakyam" of Bhasa, (First half)

UNIT IV **10 HOURS**

Text Prescribed: "Dutavakyam" of Bhasa, (Second half)

UNIT V **10 HOURS**

Translation : From the known passages of the above text.

TOTAL: 48 HOURS

TEXT BOOK :

1."Dutavakyam of Bhasa" R.S.Vadhyar and Sons Palghat, Kerala.

CO, PO, PSO Mapping

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

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

Semester III

24LUF301 **FRENCH III** **4H-3C**

(Histoire, histoire de la littérature frencais,roman, rédaction de lettres)

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

The objectives of this course are

- To enable students to recognizenative accent and usage of French language.
- To help students to become autonomous and self-directed French language learners.
- To produce entrepreneurs among students by making them French language trainers and take communicative French to schools and colleges around.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Identify new words by employing vocabulary building techniques.	Apply
CO2	Build correct sentence structures and grammatical patterns in oral and written communication	Apply
CO3	develop the ability to speak French language with the way of pronunciation.	Understand
CO4	Follow leadership, work ethics and management principles	Analyze
CO5	express values and skills gained through effective communication to other disciplines.	Analyze

UNITE I **9 HOURS**

a) Leçon – Vivre la ville,,Visiter une ville

b) Communication - Indiquer le chemin

c) Grammaire - La comparaison,Les prépositions avec les noms géographiques,Les pronoms personnels COI

d) Lexique –La ville, Les lieux de la ville, Les transports

e) Culture – Le français : une ouverture sur le monde

UNITÉ II **9 HOURS**

a) Leçon -• On vend ou on garde ?

b) Communication -Demander des renseignements touristiques

c) – Grammaire - Le pronom y (le lieu), La position des pronoms compléments Les verbes du premier groupe en -ger et -cer,

d) Les verbes ouvrir et accueillir

e) Lexique - Les points cardinaux,Les prépositions de lieu (2)

f) Culture –Le français : une ouverture sur le monde

UNITÉ III **10 HOURS**

a) Leçon - b) Communication- permetter,defendre.

c) Grammaire -La formation du pluriel (2)

Les adjectifs de couler, Les adjectifs beau, nouveau, vieux

d) Lexique - Les couleurs, Les formes,Les me

e) culture – les grandes fleuves en Francais.

UNITE IV **10 HOURS**

a) Leçon – Félicitations !

b) Communication - Décrire un objet

c) Grammaire - Les pronoms relatifs qui et que,

L'imparfait, Les verbes connaître, écrire, mette et vendre

d) Lexique – Les mesures, L'informatique

DIRE, LIRE, ECRIRE , Les sons [E] / [O] / [Œ]

e) Culture –Les lieux de la ville.

UNITÉ V **10 HOURS**

a) Leçon -En voyage !

b) Communication -• Présenter ses vœux, Faire une réservation

c) Grammaire - Les pronoms démonstratifs,La question avec Inversion,Les adverbes de manière,

d) Lexique -Les voyages,L'aéroport et l'avion,Les fêtes

e) Culture –Noël

TOTAL: 48 HOURS

REFERENCE BOOKS:

1. Cocton Marie –Noëlle , Duplex Dorothée, Heu Elodie , Kasazian Emilie, Ripaud Delphine, **Saison 1- Méthode de franca**is, Didier, paris.2015.
2. Cocton Marie – Noëlle, Dupleix, Heu Elodie, Kasazian Emilie ,Ripaud Deldphin, S**aison** 1 – **Cahier d'activites** , Dider ,Paris , 2015
3. Anne Akyüz,Bernadette Bazelle- Shahmael,JoëlleBonenfant, **Marie- Françoise Gliemenn,Les exercices de grammaire,Hachette FLE, Paris,200**5
4. Christian Beaulieu, **Je pratiqu**e, Exercises de grammaire A1, Dider,Paris,2015
5. Nathalie BIE, philippe SANTINAN,**Grammaire pour adolescents-250 exercises, CLE International , Paris , 2005**

WEBSITES :

- http:// enseigner.tv5 monde.com/
- bonjourdumonde.com /exercises/contenu/le – francais-du- tourisme.html
- http://www.bonjurdefrance.com/
- https://www.lepointdufle.net/

CO, PO, PSO Mapping

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

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

Semester III

24ENU301 ENGLISH - III 3H - 3C

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not required

COURSE OBJECTIVES (CO):

- To enable students to recognizenative accent and usage of English language.
- 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 (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Identify new words by employing vocabulary building techniques.	Apply
CO2	Build correct sentence structures and grammatical patterns in oral and written communication	Apply
CO3	develop the ability to speak English language with the correct pronunciation.	Understand
CO4	Follow leadership, work ethics and management principles	Analyze
CO5	express values and skills gained through effective communication to other disciplines.	Analyze

UNIT I **8 HOURS**

LISTENING: Listening Comprehension-Listening for Specific Information- Interpreting Chartsand 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 RulesTranslation- 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)

TOTAL: 36 HOURS

TEXT BOOKS

1. Board of Editors (2024). *Proficiency in Communication I*. Karpagam Academy of Higher Education

REFERENCE BOOKS:

1. *Martin's, St* (2013). *Oxford Handbook of Writing: Handbook of Writing*. 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

WEB SITES:

1. https://www.scribbr.com/
2. https://www.quora.com/

CO, PO, PSO Mapping

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

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

Semester III

24ADU301 OPERATING SYSTEMS 5H - 3C

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To understand the main components of an OS & their functions.
- To study the process management, scheduling and Deadlock.
- To understand the concepts and implementation Memory management policies and virtual memory.

COURSE OUTCOMES (COS):

After the completion of this course, a successful student will be able to:

COs	Course Outcomes	Blooms Level
CO1	Describe the important computer system resources	Understand
CO2	Perform the role of operating system in their management policies and algorithms.	Understand
CO3	Understand the process management policies and scheduling of processes by CPU	Apply
CO4	Evaluate the requirement for process synchronization and coordination handled by operating system.	Analyze
CO5	Analyze the memory management and its allocation policies.	Apply

UNIT I INTRODUCTION 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 PROCESS MANAGEMENT: **12 HOURS**

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 MEMORY MANAGEMENT: **12 HOURS**

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 STORAGE MANAGEMENT: **12 HOURS**

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 PROTECTION AND SECURITY: **12 HOURS**

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.

TOTAL:60 HOURS

TEXT BOOKS

1. Tanenbaum, A. S. (1987). *Operating system concepts* (2nd ed.). Pearson Education.
2. Silberschatz, A., Galvin, P. B., & Gagne, G. (2009). *Operating system concepts* (6th ed.). Wiley.
3. Tanenbaum, A. S. (2001). *Modern operating systems*. Prentice Hall.

REFERENCE BOOKS

1. Nutt, G. (2004). *Operating systems: A modern perspective* (3rd ed.). Pearson Education.
2. Bach, M. J. (1986). *The design of the UNIX operating system*. Prentice Hall.
3. Crowley, C. (1997). *Operating systems: A design-oriented approach*. Tata McGraw-Hill.
4. Palmer, M. (n.d.). *Guide to operating systems*. Vikas Thomson Learning Publishing.
5. Milenkovic, M. (1992). *Operating system concepts and design* (2nd ed.). McGraw-Hill.

CO, PO, PSO Mapping

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

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

Semester III

24ADU302 COMPUTER NETWORKS 4H - 3C

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

End Semester Exam: 3 Hours

PREREQUISITE:

- Not Required

COURSE OBJECTIVES (CO):

- 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

Course Outcomes (COs):

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

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

UNIT I **10 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

UNIT II **8 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 **10 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 **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 **10 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.

TOTAL:48HOURS

TEXT BOOKS:

1. Forouzan, B. A. (2006). *Data communications and networking* (4th ed.). Tata McGraw-Hill Education.
2. Tanenbaum, A. S. (2003). *Computer networks* (4th ed.). Pearson Education.

CO, PO, PSO Mapping

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

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

Semester III

24ADUA301 OPERATIONS RESEARCH 4H - 3C

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

End Semester Exam: 3 Hours

PREREQUISITE:

- Basic understanding of algebra and mathematical modeling.

COURSE OBJECTIVES (CO):

- To learn the basic concepts and applications of linear programming and to impart knowledge in concepts and tools of Operations Research.
- To make the student capable of formulating the various real-life decision-making problems as Mathematical programming problems.
- To enable the practical application of operations research methods for decision-making in real-world scenarios.

COURSE OUTCOMES(COs):

Upon completion of this course, the student 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	Apply methods to find initial basic feasible solutions and optimal solutions for transportation problems.	Apply
CO3	Apply different queuing models and assignment problem to solve real-life problems.	Apply
CO4	List and understand the costs involved in inventory management.	Understand
CO5	Construct project networks and perform time calculations using CPM and PERT methods.	Apply

UNIT I LINEAR PROGRAMMING 9 HOURS

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

UNIT II TRANSPORTATION MODEL 9 HOURS

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 ASSIGNMENT PROBLEM AND QUEUEING THEORY 10 HOURS

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

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

UNIT IV INVENTORY CONTROL **10 HOURS**

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

UNIT V PERT AND CPM **10 HOURS**

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

TOTAL: 48 HOURS

TEXT BOOKS:

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.

REFERENCE BOOKS:

1. Hamdy A. Taha., (2017). *Operations Research-An Introduction*, Tenth Edition, published by Dorling Kindersley (India) Pvt. Ltd., licensees of Pearson Education in South Asia.
2. Prem Kumar Gupta and Hira D.S., (2014). *Operations Research*, S. Chand & Company Ltd, Ram Nagar, New Delhi.
3. Srinivasan G., (2017). *Operations Research: Principles and Applications*, PHI, New Delhi

WEBSITES:

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

CO, PO, PSO Mapping

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

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

Semester III

24ADU311 OPERATING SYSTEMS - PRACTICAL 4H - 2C

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- 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.

COURSE OUTCOMES (COS):

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

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

LIST OF PROGRAMS:

1. Write a program (using fork() and/or exec() commands) where parent and child execute:
   a) same program, same code.
   b) same program, different code.
   c) before terminating, the parent waits for the child to finish its task.
2. Write a program to report behaviour of Linux kernel including kernel version, CPU type and model. (CPU information)
3. Write a program to report behaviour of Linux kernel including information on configured memory, amount of free and used memory. (memory information)
4. Write a program to print file details including owner access permissions, file access time, where file name is given as argument.

5. Write a program to copy files using system calls.
6. Write program to implement FCFS scheduling algorithm.
7. Write program to implement Round Robin scheduling algorithm.
8. Write program to implement SJF scheduling algorithm.
9. Write program to implement non-preemptive priority based scheduling algorithm.
10. Write program to implement preemptive priority based scheduling algorithm.
11. Write program to implement SRJF scheduling algorithm.
12. Write program to calculate sum of n numbers using thread library.
13. Write a program to implement first-fit, best-fit and worst-fit allocation strategies.

TOTAL: 48 HOURS

TEXT BOOKS:

1. Silberschatz, A., Galvin, P. B., & Gagne, G. (2018). *Operating systems concepts* (10th ed.). John Wiley & Sons.
2. Stallings, W. (2016). *Operating systems: Internals & design principles* (7th ed.). Prentice Hall of India.
3. Garrido, J. M., Schlesinger, R., & Hoganson, K. (2015). *Principles of modern operating systems* (2nd ed.). Library of Congress Cataloging-in-Publication Data.

WEBSITES:

1. www.cs.columbia.edu/~nieh/teaching/e6118_s00/
2. www.clarkson.edu/~jnm/cs644
3. pages.cs.wisc.edu/~remzi/Classes/736/Fall2002/
4. www.nptel.ac.in/operating systems.
5. http://172.16.25.76/course/view.php?id=1906.

CO, PO, PSO Mapping

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

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

Semester III

24ADU312 COMPUTER NETWORKS - PRACTICAL 4H -2C

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To learn and use network commands.
- To learn socket programming.
- To implement and analyze various network protocols.

COURSE OUTCOMES (COS):

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	Inspect the various routing algorithms.	Analyze
CO5	Identify error correction codes.	Analyze

LIST OF PROGRAMS

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.

TOTAL:48 HOURS

TEXT BOOKS:

1. Tanenbaum, A. S. (2003). *Computer networks* (4th ed.). PHI.
2. Godbole, A. (2007). *Data communication and networks*. Tata McGraw-Hill Education.
3. Black, U. (2000). *Computer networks: Protocols, standards, and interfaces* (2nd ed.). PHI.
4. Jain, S., Jain, M., Pillai, V., & Kratika. (2016). *A level data communication & network technologies*. BPB Publications.
5. Tanenbaum, A. S. (2016). *Computer networks* (7th ed.). 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-fourozan-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

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	2	2	1	-	-	-	1	-	-	-	-	-	-	2	2
CO2	3	-	1	1	1	-	-	-	1	-	-	-	-	-	-	-	-
CO3	3	-	1	1	1	-	-	-	1	-	-	-	-	-	-	-	-
CO4	3	-	1	1	1	-	-	-	1	-	-	-	-	-	-	-	-
CO5	3	-	2	1	1	-	-	-	1	-	-	-	-	-	-	-	-
Average	3	-	1.4	1.2	1	-	-	-	1	-	-	-	-	-	-	2	2

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

Semester III

24VAC301 INDIAN KNOWLEDGE SYSTEM 2H - 1C

Instruction Hours / Week: L:2 T:0 P:0 **Marks:** Internal**: 40** External**: 60 T**otal**: 100**

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To introduce students to foundational concepts in Indian Knowledge Systems (IKS), including philosophical schools, texts, and cultural practices.
- To explore the contributions of Indian mathematics, astronomy, and technology to global knowledge systems and their interdisciplinary connections.
- To analyze the ethical, philosophical, and practical implications of ancient Indian sciences and humanities in contemporary contexts.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Identify and describe key components of Indian Knowledge Systems (IKS), including Vedic and non-Vedic philosophical schools, texts such as Puranas and Itihasa, and Niti Sastras.	Understand
CO2	Analyze and evaluate the contributions of Indian mathematics and astronomy to scientific knowledge, demonstrating an understanding of their historical development and modern relevance.	Analyze
CO3	Apply foundational linguistic and phonetic principles from Sanskrit texts like Panini's Astadhyayi to understand their computational and linguistic significance.	Apply
CO4	Demonstrate proficiency in calculating and applying geometric, trigonometric, and algebraic principles from ancient Indian mathematical texts.	Apply
CO5	Critically assess the cultural, philosophical, and ethical implications of Indian sciences and humanities, including their role in shaping societal norms and values.	Analyze

UNIT I INTRODUCTION TO IKS 5 HOURS

Caturdaśa Vidyāsthānam, 64 Kalas, Shilpa Śāstra, Four Vedas, Vedāṅga, Indian Philosophical Systems, Vedic Schools of Philosophy (Sāṃkhya and Yoga, Nyaya and Vaiśeṣika, Pūrva-Mīmāṃsā and Vedānta), Non-Vedic schools of Philosophical Systems (Cārvāka, Buddhist, Jain), Puranas (Maha-puranas, Upa-Puranas and Sthala-Puranas), Itihasa (Ramayana, Mahabharata), Niti Sastras, Subhasitas

UNIT II FOUNDATION CONCEPT FOR SCIENCE & TECHNOLOGY 5 HOURS

Linguistics & Phonetics in Sanskrit (panini's), Computational concepts in Astadhyayi Importance of Verbs, Role of Sanskrit in Natural Language Processing, Number System and Units of Measurement, concept of zero and its importance, Large numbers & their representation, Place Value of Numerals, Decimal System, Measurements for time, distance and weight, Unique approaches to represent numbers (Bhūta Saṃkhya System, KaṭapayādiSystem), Pingala and the Binary system, Knowledge Pyramid, Prameya – A Vaiśeṣikan approach to physical reality, constituents of the physical reality, Pramāṇa, Saṃśaya

UNIT III INDIAN MATHEMATICS & ASTRONOMY 5 HOURS

Indian Mathematics, Great Mathematicians and their contributions, Arithmetic Operations, Geometry (Sulba Sutras, Aryabhatiya-bhasya), value of π, Trigonometry, Algebra, Chandah Sastra of Pingala,Indian Astronomy, celestial coordinate system, Elements of the Indian Calendar Aryabhatiya and the Siddhantic Tradition Pancanga – The Indian Calendar System Astronomical Instruments (Yantras) Jantar Mantar or Raja Jai Singh Sawal.

UNIT IV INDIAN SCIENCE & TECHNOLOGY 5 HOURS

Indian S & T Heritage ,sixty-four art forms and occupational skills (64 Kalas) Metals and Metalworking technology (Copper, Gold, Zinc, Mercury, Lead and Silver), Iron & Steel, Dyes and Painting Technology), Town & Planning Architecture in India, Temple Architecture, Vastu Sastra,

UNIT V HUMANITIES & SOCIAL SCIENCES 4 HOURS

Health, Wellness & Psychology, Ayurveda Sleep and Food, Role of water in wellbeing Yoga way of life Indian approach to Psychology, the Triguṇa System Body-Mind-Intellect-Consciousness Complex. Governance, Public Administration & Management reference to ramayana, Artha Sastra, Kauṭilyan State.

TOTAL: 24 HOURS

TEXT BOOKS:

1. Kapur K and Singh A. K (Eds) (2005). *Indian Knowledge Systems*, Vol. 1. Indian Institute of Advanced Study, Shimla.
2. Nair, Shantha N. (2008) *Echoes of Ancient Indian Wisdom.* Hindology Books, New Delhi

REFERENCE BOOKS:

1. Reshmi ramdhoni,(2018). *Ancient Indian Culture and Civilisation*, star publication
2. DK Chakkrabarty, Makkhan Lal,(2014) *History of Ancient India*, Aryan book International publication,
3. Dr. Girish Nath Jha, Dr. Umesh Kumar Singh and Diwakar Mishra,(2016). *Science and Technologyin Ancient Indian Texts*, DK Print World limited,
4. Swami BB Vishnu, (2015). *Vedic Science and History - Ancient Indian's Contribution to the ModernWorld*, Gosai publication.

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	P012	P013	P014	P015	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	3	3	-	-	2	-	2
CO2	-	-	-	-	-	-	-	-	2	-	3	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	2
CO4	-	-	-	-	-	-	-	-	2	-	3	3	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	3	3	1	-	2	-	2
Average	-	-	-	-	-	-	-	-	2	-	3	3	1	-	2	-	2

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

Semester III

24ADU391	**INTERNSHIP**	**H - 2C**

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

End Semester Exam: 3 Hours

Semester IV

24LSUT401 **LANGUAGE – IV/ தமிழர் நாகரிகமும் பண்பாடும்** **4H - 3C**

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

End Semester Exam: 3 Hours

PREREQUISITE:

- Student Must studied Tamil from 1st standard to higher secondary level.

பாடத்திட்டப் பொதுநோக்கம்

- வரலாற்றுக்கு முற்பட்ட தமிழகத்தின் சிறப்பை அறியச்செய்தல்.
- தமிழின் தொன்மையை மாணர்களுக்கு எடுத்துரைத்தல்.
- பழந்தமிழர் வாழ்க்கை முறையை உணர்த்துதல்.

பாடத்திட்டப் பயன்விளைவு

- தமிழ்மொழி வரலாறு குறித்த தெளிந்த அறிவு பெற்றிருத்தல்.
- தமிழரின் மரபு சார்ந்த மொழியின் செல்வாக்கை அறிதல்.
- பழந்தமிழ் இலக்கியங்களின்வழி பண்பாடு கலாச்சாரம் போன்றவற்றை அறிதல்.
- ஐவகை நிலஅமைப்பு, வாழ்வியல் ஒழுக்கலாறுகளைப் பெற்றிருத்தல்.
- இலக்கியங்களின்வழி கலைகளின் வளர்ச்சி மற்றும் அமைப்பு முறையை அறிதல்.

அலகு – I வரலாற்றுக்கு முற்பட்ட தமிழகமும் சங்ககால வரலாறும் **(10 மணிநேரம்)**

வரலாறும் நிலஅமைப்பும் – வரலாற்றின் செல்வாக்கு – பல்வேறு காலங்களில் வரலாறு உண்டாக்கிய நாட்டுப் பிரிவுகள் - பழைய கற்காலம் – புதிய கற்காலம் – இரும்புக் காலம்.

அலகு – 2 தமிழின் தொன்மை **(10 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 **(10 மணிநேரம்)**

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

அலகு – 4 கட்டடக்கலையும் தமிழர் பண்பாடும் **(10 மணிநேரம்)**

கட்டடக்கலை தோற்றுவாய் – முதற்கலை – கட்டடக்கலையின் பழைமை – புதிய கற்காலம் – சங்ககாலம் – கோயில்கள் –

அரண்மனைகள் – கோட்டைகள் – வீடுகள் – நீர்ப்பாசனக் கட்டடக்கலை – தமிழர் கட்டடக் கலையின் தனிச்சிறப்பு.

அலகு – 5 ஆற்றங்கரை நாகரிகம் (8 மணிநேரம்)

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

மொத்த மணிநேரம் 48

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.

இணையதளம்

1. www.tvu.org.in
2. www.maduraitamilproject.com

இதழ்கள்

1. **International Research Journal of Indian Literature, irjil.in**
2. **International Tamil Research Journal, iorpress.in**

CO, PO, PSO Mapping

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

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

24LUH401 **HINDI-PAPER- IV** **4H - 3C**

(Modern Poetry, One Act, Essay, Translation)

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

End Semester Exam: 3 Hours

PREREQUISITE:
Not Required

COURSE OBJECTIVES(CO):

- Develop an interest in the appreciation of short stories
- Comprehend the grammatical structures and sentence making
- Understand the language and developing English to Hindi translation skill

COURSE OUTCOMES(COs):

- Learning the literacy knowledge of Hindi specially reading and writing .
- Learning the literary knowledge specially reading and understanding of Hindi short Stories
- Learning the history of Hindi literature.
- The ability to translate from Hindi to English and from English to Hindi will be improved.
- Develop a skill in spoken Hindi.

UNIT I a) Poetry – Lakshmanan ke Bare Me **9 HOURS**

b) Bharath ka Bhagya

c) Essay – Dhokha

d) Translation – Lesson – 1 to 3

UNIT II a) Poetry – Soorpanakha Ki Visheshatha **9 HOURS**

b) Bahu Ki Vida

c) Essay – Jabaan

d) Translation– Lesson – 4 to 6

UNIT III a) Poetry– Kavya Ke AdharPar **10 HOURS**

b) Reed Ki Haddi

c) Essay – Kya Janvar Bhee Sochthi Hai

d) translation– Lesson – 7 to 9

UNIT IV a) Khanda Kavya Ke Adhar Par Panchavati **10 HOURS**

b) Rajputhni Ka Badhala

c) Essay – Shradha-Bhakthi

d) Translation– Lesson – 10 to 12

UNIT V a) Kavya Ke Adhar Par Prakruthik Varnan **10 HOURS**

b) Bheem Aur Raakshas

c) Essay – Adhunik Nari

d) Translation – Lesson –13 to 15

TOTAL: 48 HOURS

REFERENCE BOOKS:

1.Poetry : Panchavati

Writer : Mythili Sharan Guptha

Publisher : Bharathiya Sahithya Sangrah

Kanpur – 208002, Uttar Pradesh

2.One Act Play : Adarsh Akanki

Publisher : D.B.Hindi Prachar Sabha

T. Nagar,Chennai – 600017, Tamil Nadu

3.Essay : Nibandh Nishchay

Editor : Dr.Sharadh Ranjan

Publisher : Hindi Sahithya Sammelan Prayag

12.Sammelan Marg, Illahabadh

4.Translation : Anuvadh Abhyas – III

Publisher : D.B.Hindi Prachar Sabha

T.Nagar, Chennai – 600017, Tamil Nadu

CO, PO, PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	**3**	**2.6**	**2.6**	**-**	**-**	**-**	**-**	**-**	-	-	-	-	-	-	-	-	-

Semester IV

24LUM401	**MALAYALAM IV**	**4H-3C**

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

PREREQUISITE:

Not required

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

COURSE OBJECTIVE(CO):

- Knowledge of contemporary drama contents of Malayalam literature
- Learn Screen play and its techniques. The ability to read drama and express criticism about it and the ability to express social thoughts will improve
- There will also be litigation messages in Malayalam and news on speech techniques Able to write articles on their own and improve their creative skills.

COURSE OUTCOME(COs):

- Get a basic knowledge of drama
- Can read and critique Screenplay
- Create interest in art literature courses
- The hope of writing a Drama or a Screen Play
- The idea of creating new works and critique knowledge willimprove.

Unit No.	PART I – MALAYALAM IV	Hours
I	Screen Play - Perumthachan	**10**
II	Screenplay - Perumthachan	**10**
III	Drama - Saketham	**10**
IV	Drama - Saketham	**09**
V	Drama - Saaketham	**09**
	TOTAL	**48**

TEXT BOOKS:

1. Perumthachan – M.T.VasudevanNair,DC Books
2. Saketham – C.N.SreekandanNair,DC Books

REFERENCE BOOKS:

1.MalayalaNatakaSahithyaCharithram. G Sankara Pillai (Kerala SahithyaAkademi, Trissur) 2. Malayala Nataka Sahithya Charithram, Vayala Vasudevan Pillai (Kerala Sahithya Akademi Thrissur).

3. Natakam- OruPatanam (C.J. SmarakaPrasanga Samithi, Koothattukulam) Natakaroopacharcha, Kattumadam Narayanan (NBS, Kottayam)

4.Chalachithrasameeksha–Vijayakrishanan.

5. Cinemayude Paadangal-VisakalanavumVeekshanavum – Jose-K.Manual.

CO, PO, PSO Mapping

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

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

Semester IV

24LUS401	**SANSKRIT IV (Lyrics, Grammar and Translation)**	**4H-3C**

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not required

COURSE OBJECTIVES(CO):

- The fundamental objective of the curriculum is to impart effective science education at the undergraduate level, exposing them to recent trends and developments in the subject.
- Creating scientific temper is another major objective of this curriculum.
- Another major thrust given here is to develop an environmental concern in all activities ofthe students. 'Go green', the motto of the syllabus emphasizes the urgent need to conserve nature without destruction of natural resources.

COURSE OUTCOMES(COs) :

- **Critical Thinking** :Take informed actions after identifying the assumptions that frame students' thinking and actions.
- **Problem Solving**: Understand and solve problems of relevance to society to meet the specified needs using the knowledge, skills and attitudes acquired.
- **Effective Communication**: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.
- **Effective Citizenship**: Demonstrate empathetic social concern and equity centered national development.
- **Environment and Sustainability**: Understand the issues of environmental contexts and sustainable development.

UNIT I **9 HOURS**

Introduction to Sanskrit Lyrics and erotic literature.

UNIT II **9 HOURS**

Devotional Literature, Important works

UNIT III **10 HOURS**

Krishnakarnamrita of Leelasuka (Second Section only)

UNIT IV **10 HOURS**

Grammar – Past tense, Declension of personal pronouns

UNIT V **10 HOURS**

Simple sentences from Sanskrit Self Teacher

TOTAL: 48 HOURS

TEXT BOOK:

Krishnakarnamrita of LeelasukaSri Ramakrishna Mud Mylapore, Chennai.

CO, PO, PSO Mapping

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

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

Semester IV

24LUF401 **FRENCH IV** **4H-3C**

(Comprehension,Tradusion, Reduction,Une act)

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

The objectives of this course are:

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

COURSE OUTCOMES (COS):

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

COs	Course Outcomes	Blooms Level
CO1	make the students proficient communicators in French.	Apply
CO2	develop learners' ability to understand French.	Understand
CO3	understand the nuances of listening, speaking and reading French.	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 French better.	Apply

UNITE I **9 HOURS**

a) Leçon – On fait le ménage !

b) Communication - Protester et réagir

c) Grammaire - Le présent progressif, Les pronoms possessifs
La phrase négative (3)

d) Lexique –• Le logement,La maison,Les pièces

e) Culture – Paris et ses symboles

UNITE II **9 HOURS**

a) Leçon – À propos de logement

b) Communication – Exprimer l'intérêt et l'indifférence

c) Grammaire – Quelques adjectifs et pronoms indéfinis

Les verbes lire, rompre et se plaindre

d) Lexique – Meubles et équipement,Les tâches ménagères

e) Culture – Les fêtes et les traditions en France

UNITE III **10 HOURS**

a) Leçon – Tous en forme ! Accidents et catastrophes

b) Communication – Raconter au passé

c) Grammaire – Le passé composé et l'imparfait

Le passé récent, L'expression de la durée,

d) Lexique – Le corps humain : l'extérieur,Le corps humain :

l'intérieur Les maladies et les remèdes

e) Culture – La longue histoire de la Francophonie

UNITE IV **10 HOURS**

a) Leçon – Faire ses études à l'étranger

b) Communication -• Exprimer la peur et rassurer

c) Grammaire - Les adjectifs et les pronoms ,indéfi nis : rien, personne, aucun Les verbes dire, courir mourir

d) Lexique – Les accidents,Les catastrophes naturelles

e) Culture - Les jeux de la Francophonie .

UNITE V **10 HOURS**

a) Leçon – Bon voyage !La méte

b) Communication - Exprimer son opinion, Parler de la météo

c) Grammaire -• Les pronoms démonstratifs neutres

Le futur simple, Situer dans le temps

d) Lexique – Le système scolaire,Les formalités pour partir à

l'étranger • La météo

e) Culture- Le français hors de France

TOTAL: 48 HOURS

REFERENCE BOOKS:

1. Cocton Marie –Noëlle , Duplex Dorothée, Heu Elodie , Kasazian Emilie, Ripaud Delphine, **Saison 1- Méthode de francais**, Didier, paris.2015.
2. Cocton Marie – Noëlle, Dupleix, Heu Elodie, Kasazian Emilie ,Ripaud Deldphin**, Saison 1 – Cahier d'activites ,** Dider ,Paris , 2015
3. Anne Akyüz,Bernadette Bazelle- Shahmael,JoëlleBonenfant, Marie- Françoise Gliemenn,Les **exercices de grammaire,Hachette FLE,** Paris,2005
4. Christian Beaulieu, **Je pratique**, **Exercises de grammaire A**1, Dider,Paris,2015
5. Nathalie BIE, philippe SANTINAN,Gra**mmaire pour adolescents-250 exercises, CLE International , Paris , 2005**

WEBSITES :

- http:// enseigner.tv5 monde.com/
- bonjourdumonde.com /exercises/contenu/le – francais-du- tourisme.html
- http://www.bonjurdefrance.com/
- https://www.lepointdufle.net/

CO, PO, PSO Mapping

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

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

Semester IV

24ENU401 **ENGLISH-IV** **3H - 3C**

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not required

COURSE OBJECTIVES(CO):

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

COURSE OUTCOMES (COS):

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.	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

UNIT I **8 HOURS**

Concept of Communication- Barriers to Communication- Body Language-PersonalityDevelopment-Etiquette and Manners-Soft Skills

UNIT II **7 HOURS**

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

UNIT III **7 HOURS**

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

UNIT IV **7 HOURS**

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

UNIT V **7 HOURS**

Punctuation Marks- Figures of Speech

TOTAL: 36 HOURS

TEXT BOOK:

1. Board of Editors (2024). *Proficiency in Communication II*, Karpagam Academy of Higher Education

REFERENCE BOOKS:

1.Martin's, St (2013). *Oxford Handbook of Writing: Handbook of Writing.* 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.

WEB SITES:

1. https://www.skillsbuilder.org/blog/top-5-speaking-skills-for-success-in-interviews
2. https://www.coursera.org/articles/interviewing-skills

CO, PO, PSO Mapping

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

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

Semester IV

24ADU401 RELATIONAL DATABASE MANAGEMENT SYSTEMS 4H - 3C

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

End Semester Exam: 3 Hours

PREREQUISITE: Not required

COURSE OBJECTIVES (CO):

- 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.

COURSE OUTCOMES (COs):

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	Understand
CO2	Express the ways to work with combined table using relational model	Apply
CO3	Applying normalization techniques and organize the order of storing data	Analyze
CO4	Develop SQL and PL/SQL operations	Apply
CO5	Make use of the complex queries using SQL	Apply

UNIT I INTRODUCTION 8 HOURS

Introduction to DBMS – Information-Data and Data Management-File-based data management – Database System - DBMS - Components of a DBMS- Database User-Database Architecture and Design- Data Abstraction - Physical and Logical Data Independence

UNIT II DATA MODELS 10 HOURS

Data Models-Introduction-Conceptual, Physical Models-Hierarchical Model - Network Model-Relational Model – E-R Model- Entity – Relationship (E-R) Modeling: Introduction – E-R Model - Components of an E-R Model-Relationships- Relationships, E-R conventions- Composite Entities - Entity List-E-R diagrams, E-R Modeling Symbols

UNIT III RELATIONAL DATABASE DESIGN 10 HOURS

Data Integrity, Constraints and Normalization: Introduction-Integrity Constrains - Normalization-Keys-Relationships-Normalization - Keys-Relationships-First Normal Form(1NF)-Second Normal form(2NF) - Third Normal Form(3NF)- Boyce-Codd Normal Form (BCNF)

UNIT IV -SQL CONCEPTS 10 HOURS

Introduction to SQL, DDL, DML, and DCL statements, Creating Tables, Adding Constraints, Altering Tables, Update, Insert, Delete & various Form of SELECT- Simple, Using Special Operators for Data Access. Aggregate functions, Joining Multiple Tables (Equi Joins), Joining a Table to itself (self Joins)

UNIT V PL/SQL CONCEPTS **10 HOURS**

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

TEXT BOOK **TOTAL: 48 HOURS**

1 Elmasri, R., & Navathe, S. B. (2019). *Fundamentals of database systems* (6th ed.). Pearson Education.

2 Silberschatz, A., Korth, H. F., & Sudarshan, S. (2018). *Database system concepts* (6th ed.). Tata McGraw-Hill.

REFERENCE BOOK

1 Bayross, I. (2018). *SQL, PL/SQL: The programming language of Oracle* (5th ed.). BPB Publications.

2 Bhatia, P. (2016). *PL/SQL for beginners: A simplified approach* [Kindle edition].

3 Date, C. J., Kannan, A., & Swamynathan, S. (2015). *An introduction to database systems* (8th ed.). Pearson Education.

WEBSITES

1 http://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm

2 https://www.javatpoint.com/dbms-tutorial

CO, PO, PSO Mapping

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

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

Semester IV

24ADU402 NETWORK SECURITY 4H - 2C

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

End Semester Exam: 3 Hours

PREREQUISITE: Not Required

COURSE OBJECTIVES (CO):

- 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.

COURSE OUTCOMES (COs):

- At the end of this course students will be able to introduce about firewalls and web security
- To provide basic knowledge about IP Security

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

UNIT I INTRODUCTION TO NETWORK SECURITY 10 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 10 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 10 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 **10 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

TEXT BOOK **TOTAL:48 HOURS**

1. Stallings, W. (2020). *Cryptography and network security: Principles and practice* (8th ed.). Pearson.
2. Forouzan, B. A. (2015). *Cryptography and network security* (3rd ed.). McGraw-Hill.

REFERENCE BOOKS

1. Stallings, W. (2016). *Network security essentials: Applications and standards* (6th ed.). Pearson Prentice Hall.
2. Kaufman, C., Perlman, R., & Speciner, M. (2002). *Network security: Private communication in a public world* (2nd ed.). Prentice Hall PTR.
3. Nestler, V. J., et al. (2014). *Principles of computer security: Lab manual* (4th ed.). McGraw-Hill.

WEBSITE

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,%20Second%20Edition%20(%20PDFDrive%20).pdf

CO, PO, PSO Mapping

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

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

Semester IV

24ADU403 FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE 3H - 3C

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- Gain a historical scope and challenges of AI problems
- Analyze the knowledge representation and learning different search algorithms in specific problem scenarios.
- Explore an ability to share in discussions of AI, its current scope and limitations and implications.

COURSE OUTCOMES (COs):

- Understand the effectiveness methods of algorithms in finding optimal solutions.
- Analyze the discussion of problem-solving skills by applying different search strategies to solve AI problems.

COs	Course Outcomes	Blooms Level
CO1	Extend the Scope and Challenges of AI Problems	Understand
CO2	Infer the performance and efficiency of different search algorithms in specific problem scenarios.	Understand
CO3	Discover an ability to share in discussions of AI, its current scope and limitations and implications.	Analyze
CO4	Develop the effectiveness of heuristic search algorithms in finding optimal solutions.	Apply
CO5	Classify the problem-solving skills by applying different search strategies to solve AI problems.	Apply

UNIT I INTRODUCTION TO AI 8 HOURS

Introduction: AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth-First, Depth-First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), Constraint Satisfaction (Backtracking, Local Search)

UNIT II ADVANCED SEARCH 8 HOURS

Advanced Search: Constructing Search Trees, Stochastic Search, A* Search Implementation, Minimax Search, Alpha-Beta Pruning Basic Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem.

UNIT III ADVANCED KNOWLEDGE REPRESENTATION AND REASONING 8 HOURS

Advanced Knowledge Representation and Reasoning: Knowledge Representation Issues, Nonmonotonic Reasoning, Other Knowledge Representation Schemes Reasoning Under Uncertainty: Basic probability, Acting Under Uncertainty, Bayes' Rule, Representing Knowledge in an Uncertain Domain, Bayesian Networks

UNIT IV LEARNING 6 HOURS

Learning: What Is Learning? Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, Winston's Learning Program, Decision Trees.

UNIT V EXPERT SYSTEMS 6 HOURS

Expert Systems: Representing and Using Domain Knowledge, Shell, Explanation, Knowledge Acquisition.

SUGGESTED READINGS TOTAL 36 HOURS

1. Russell, S., & Norvig, P. (2021). *Artificial intelligence: A modern approach* (4th ed.). Prentice Hall.
2. Brown, P. L. (2019). *Applied artificial intelligence.*
3. Patterson, D. (2015). *Introduction to artificial intelligence*. Pearson Education..

REFERENCE BOOK

1. Elaine Rich, Kevin Knight, Shivasankar B. Nair. (2014) *Artificial Intelligence* The McGraw Hill publications, 4thEdition.

2. George F. Luger. (2010). *Artificial Intelligence: Structures and Strategies for Complex Problem Solving*, Pearson Education, 6th Edition.

WEBSITES

1. https://www.simplilearn.com/tutorials/artificial-intelligence-tutorial/what-is-artificial-intelligence
2. https://news.microsoft.com/wp-content/uploads/prod/sites/93/2020/04/Student-Guide-
3. Module-1-Fundamentals-of-AI.pdf
4. https://www.ics.uci.edu/~dechter/courses/ics-171/fall-06/lecture-notes/intro-class.ppt
5. https://nptel.ac.in/courses/112/103/112103280/
6. https://study.com/academy/topic/fundamentals-of-artificial-intelligence.html

CO, PO, PSO Mapping

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

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

Semester IV

24ADUA401 **PROBABILITY AND STATISTICS** **4H - 3C**

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

End Semester Exam: 3 Hours

PREREQUISITE:

- Basic understanding of algebra, arithmetic, elementary statistics, and probability.

COURSE OBJECTIVES (CO):

- To understand the basic concepts in probability theory and the nature of uncertainty.
- To develop the ability to work with discrete and continuous probability distributions, understand their properties, and apply the Central Limit Theorem.
- To equip students with skills in univariate and bivariate analysis, including measures of central tendency, dispersion, correlation, regression, and the construction of index numbers.

COURSE OUTCOMES(COs):

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

COs	Course Outcomes	Blooms Level
CO1	Understand the counting principles, probability rules, and theorems to solve probability problems.	Understand
CO2	Apply probability distributions such as Binomial, Poisson, Uniform, Normal, and Exponential to real-world scenarios.	Apply
CO3	Solve measures of central tendency and dispersion to data sets.	Apply
CO4	Utilize the correlation or regression methods to find the relationship between two variables.	Apply
CO5	Understand the basic concept of index numbers and weighted index numbers.	Understand

UNIT I BASICS OF PROBABILITY **10 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 **10 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 10 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 9 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 9 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.

TOTAL: 48 HOURS

TEXT BOOKS:

1. Pillai, R.S.N. and Bagavathi, V. (2002). *Statistics*, S. Chand & Company Ltd, New Delhi.
2. Srivastava, T.N. and Shailaja Rego. (2012). *Statistics for Management*, 2nd Edition, McGraw HillEducation, New Delhi.
3. Evans James, R. (2017). *Business Analytics*, 2nd Edition, Pearson Education, New Delhi.

REFERENCE BOOKS:

1. Dinesh Kumar, U. (2017). *Business Analytics: The Science of Data - Driven Decision Making*, Wiley, New Delhi.
2. Sheldon Ross, (2007). *Introduction to Probability Model*, Ninth Edition, Academic Press, Indian Reprint.
3. Robert V. Hogg, Joseph W. McKean and Allen T. Craig., (2007). *Introduction to Mathematical Statistics*, Pearson Education, Asia.
4. Irwin Miller and Marylees Miller, John E. Freund, (2006). *Mathematical Statistics with Application*, Seventh Edition, Pearson Education, Asia.

WEBSITES:

1. https://ocw.mit.edu/courses/mathematics/18-05-introduction-to-probability-and-statistics-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

CO, PO, PSO Mapping

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

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

SEMESTER IV

24ADU411 RELATIONAL DATABASE MANAGEMENT SYSTEMS - PRACTICAL 3H - 2C

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

End Semester Exam: 3 Hours

PREREQUISITE: RDBMS Basic Concepts and Commands

COURSE OBJECTIVES (CO):

- Demonstrate the SQL Queries in RDBMS.
- Construct the Key Constraints.
- Solve the Aggregate Functional Queries on different database tables.

COURSE OUTCOMES (COS):

At the end of this course, students will be able to know Sketch the Queries using PL/SQL

COs	Course Outcomes	Blooms Level
CO1	Explain the SQL Queries on Fundamental Concepts in RDBMS.	Understand
CO2	Validate the Queries using Key Constraints.	Understand
CO3	Implement the Aggregate Functional Queries on various tables	Analyze
CO4	Demonstrate the different types of Joints using SQL Query.	Apply
CO5	Develop the Queries using PL/SQL Exception Handling, Triggers, Cursors, Procedures, Packages.	Understand

List of Programs

1. To implement Data Definition language

2.To implement Data Manipulation language

3. To implementation on DCL and TCL

4. To implement the following Constraints

(a) Primary key

(b) Foreign Key

(c) Check

(d) Unique

(e) Null

(f) Not null

5. Create a table with following fields:

Employee table:

Field name	Constraint	Type	Size
Employee_no	Primary key	Character	6
Employee_name		Character	30
Address		Character	25
Designation		Character	15
Dob		Date	
Gender	Check	Character	1
Doj		Date	
Salary		Number	10,2

Queries:

a) Display name of the employees whose salary is greater than "10,000".
b) Display the details of employees in ascending order according to Employee Code
c) Display the details of employees earning the highest salary
d) Display the names of employees who earn more than "Ravi".

6. Create table named Student with following fields and insert the values:

Field name	**field type**	**field size**
Student Name	**Character**	15
Gender	**Character**	6
Roll No.	**Character**	10
Department Name	**Character**	15
Address	**Character**	25
Percentage of marks	**Number**	4,2

Queries:

a) Calculate the average mark percentage of the students
b) Display the names of the students whose percentage marks are greater than 80%
c) Display the details of the students who got the highest percentage of marks
d) Display the details of the students whose mark percentage between 50 and 70
e) Display the details of the students whose mark percentage is greater the mark percentage of Roll No=12CA01

1. Create a table with following fields:

Staff table:

Field name	Constraint	Type	Size
Staff_no	Primary key	Character	6
Staff_name		Character	30
Dob		Date	
Dept_code	Foreign key	Character	4
Designation		Character	15
Basic		Number	7,2

Department table:

Field name	constraint	Type	Size
Dept_code	Primary key	Character	4
Dept_name		Character	30

Execute the following queries:

1. To list the staff who joined 2 years back.
2. To list the staff in computer science dept.
3. To list the staff_name and the dept_name in which he/she works.
4. To list the maximum and minimum salary in each dept.
5. To list the dept along with the total amount spent on salary
6. To list the name of the employees who draw the salary more than the average salary.

2. Create a table with the following fields:

Book table:

Field name	Constraint	Type	Size
Access_no	Primary key	Character	6
Title		Character	30
Author		Character	30
Publisher		Character	30
Subject		Character	10
Price		Number	6,2

Execute the following queries:

1. The title of C and C++ books.

2. The books written by a particular author.

3. The books which costs between Rs.300/- and Rs.500/-

4. The number of books available in each subject.

5. The books in the decreasing order of the cost.

3. Create a table with the following fields:
   Account table:

Field name	Constraint	Type	Size
Acc_no	Primary key	Number	4
Cust_name		Varchar2	30
Branch_name		Varchar2	30
Cust_city		Varchar2	30

   Borrower table:

Field name	Constraint	Type	Size
Acc_no	Foreign key	Number	30
Branch_name		Varchar2	30
Amount		Number	8,2

   Write queries to perform different types of Join.

10. Write a PL/SQL block to create and handle User Defined Exception
    clientmaster

Field name	Constraint	Type	Size
Client_id		Number	6
Client_name		Varchar2	30
Address		Varchar2	50
Phone		Number	10
Balance		Number	10,2

11. Create table with following fields:

    Product table:

Field name	Constraint	Type	Size
Product_code	Primary key	Varchar2	7
Product_name		Varchar2	30

Price		Number	6,2
Quantity		Number	4

Vendor table:

Field name	Constraint	Type	Size
Vendor_name		Varchar2	30
Vendor address		Varchar2	30
Product_code	Foreign Key	Varchar2	7

Create a Trigger to fire when the Record is deleted and inserted.

12. Write a PL/SQL trigger to update the records while deleting the one record in another table.

Voters_master:

Field name	Constraint	Type	Size
Voterid	Primary key	Number	5
Name		Varchar2	30
Ward_no	Primary Key	Number	4
Dob		Date	
Address		Varchar2	150

New_list

Field name	Constraint	Type	Size
Voterid		Number	5
Ward_no		Number	4
Name		Varchar2	30
Description		Character	50

13. Create a table to store the salary details of the employees in a company. Declare the Cursor id to contain empno, employee name and net salary. Use cursor to update the employee details.

Salary:

Field name	Constraint	Type	Size
Emp_no	Primary key	Number	4

Emp_name		Varchar2	30
Designation		Varchar2	25
Dept		Varchar2	30
Basic		Number	5

14. Create a table stock contains the itemcode varchar2(10), itemname varchar2(50), current_stocknumber(5), date_of_last_purchase date. Write a stored procedure to seek for an item using itemcode and delete it, if the date of last purchase is before 1 year from the current date. If not, update the curent stock.

15. Create a Package in PL/SQL

TOTAL : 36 HOURS

TEXT BOOKS:

1. Elmasri, R., & Navathe, S. B. (2019). *Fundamentals of database systems* (6th ed.). Pearson Education
2. Silberschatz, A., Korth, H. F., & Sudarshan, S. (2018). *Database system concepts* (6th ed.). Tata McGraw-Hill.
3. Bayross, I. (2018). *SQL, PL/SQL: The programming language of Oracle* (5th ed.). BPB Publications..

REFERENCE BOOK:

1. Bhatia, P. (2016). *PL/SQL for beginners: A simplified approach* [Kindle edition].

2. Date, C. J., Kannan, A., & Swamynathan, S. (2015). *An introduction to database systems* (8th ed.). Pearson Education.

WEBSITES

1. http://www.tutorialspoint.com/sql/sql-rdbms-concepts.htm
2. https://www.javatpoint.com/dbms-tutorial
3. https://www.javatpoint.com/dbms-sql-introduction
4. www.databasedir.com
5. http://plsql-tutorial.com/

CO, PO, PSO Mapping

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

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

Semester IV

24ADU412 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

PREREQUISITE:

COURSE OBJECTIVES (CO)

- To learn Unix commands and shell programming.
- To implement various CPU Scheduling Algorithms.
- To implement Process Creation and Inter Process Communication.

COURSE OUTCOMES (COs):

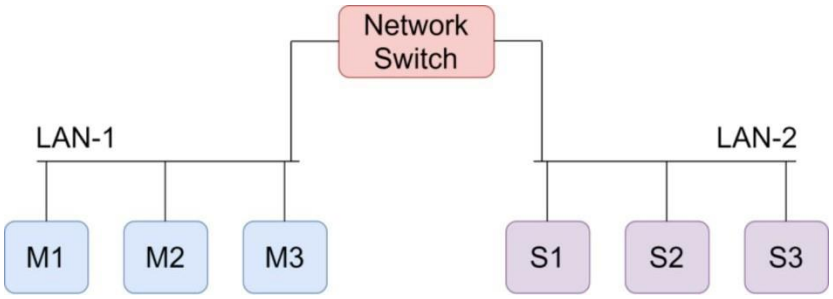
At the end of this course, students will be able to know Sketch the Queries using PL/SQL **&** implement Page Replacement Algorithms, File Organization and File Allocation Strategies

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

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).

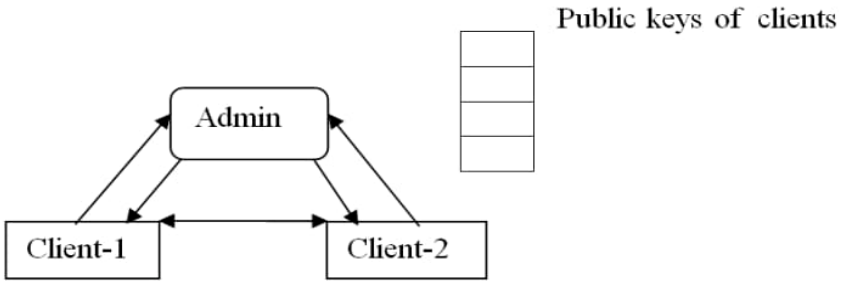
2. Create a SPAN port in the network switch and send the mirrored traffic to a promiscuous mode port for the purpose of IDS and other packet analysis. Practice port based and VLAN based mirroring.

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. Analyze 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 Kismat to gather information wireless network and try attacks like CowPatty and Airsnort. Further execute aircrackng 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: **TOTAL: 36 HOURS**

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

CO, PO, PSO Mapping

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

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

SEMESTER IV

24VAC401 **UNIVERSAL HUMAN VALUES** **2H - 1C**

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To develop the holistic perspective based on self-exploration about themselves, family, society and nature/existence.
- To understand harmony in themselves, family, society and nature/existence.
- To strengthen the self-reflection.
- To develop the commitment and courage to act.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Become more aware of themselves and their surroundings (family, society, nature).	Understand
CO2	Be more responsible in life.	Apply
CO3	Deal with problems with sustainable solutions, while keeping human relationship and human nature in mind.	Analyze
CO4	Develop consciousness of themselves through the control of mind.	Evaluate
CO5	Nuture human to live with mutual happiness and prosperity with rest of nature	Analyze

UNIT I INTRODUCTION **5 HOURS**

Purpose and motivation for the course, recapitulation from universal human values I. Self-exploration-what is it? – its content and process; 'Natural Acceptance' and Experiential Validation- as a process for self-exploration. Continuous Happiness and prosperity. A look at basic human Aspiration. Right understanding, Relationship and physical Facilities-the basic requirements for fulfillment of aspirations of every human being with their correct priority. Understanding Happiness and prosperity correctly- A critical appraisal of the current scenario. Method of fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT II UNDERSTANDING HARMONY IN THE HUMAN BEING – HARMONY IN MYSELF **5 HOURS**

Understanding human being as a co-existence of the sentiment 'I' and the material 'Body'. Understanding the needs of self ('I') and 'Body' – sukh and Suvidha. Understanding the body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I'. Understanding the harmony of I with the Body: Sanyam and helth; correct appraisal of physical needs, meaning of prosperity in detail. Programs to ensure Sanyam and health.

UNIT III UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY- HARMONY IN HUMANHUMAN RELATIONSHIP 5 HOURS

Understanding values in human-human relationship; meaning of justice (nine universal values in relationship) and program for its fulfillment to ensure mutual happiness; Trust and respect as the foundational values of relation, Understanding the meaning of trust; Difference between intention and competence understanding the meaning of respect, Difference between respect and differentiation; the other salient values in relationship. understanding harmony in the family and society (society being an extension of family): Resolution, prosperity, fearlessness and coexistence as comprehensive human goals. Visualizing a universal harmonious order in society- undivided society, universal order- from family to world family.

UNIT IV UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE- WHOLE EXISTENCE AS CO- EXISTENCE 4 HOURS

Understanding harmony in the nature, Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature. Understanding existence as co-existence of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

UNIT V IMPLICATION OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS 5 HOURS

Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics: a) Ability to utilize the professional competence for augmenting universal human order b) Ability to identify the scope and characteristics of people-friendly and ecofriendly production systems, c) Ability to identify and develop appropriate technologies and management patters for above production systems. Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers b) At the level of society: as mutually enriching institutions and organizations.

TOTAL: 24 HOURS

TEXT BOOKS:

1. Gaur,R.R, Sangal,R and Bagaria,G.P,(2010). *A foundation course in Human Values and professional Ethics*, Excel books, New Delhi.
2. Schumacher. E.F, *Small is Beautiful: Economics as If People Mattered*,Perennial Library.
3. Cecile Andrews, (2006). *Slow is Beautiful*, New Society Publishers.

REFERENCE BOOKS:

1. Joseph Cornelius Kumaruppa,(Digitized 30 Oct 2019). *The Economy of Permanence*.
2. Mahatma Gandhi, (1983). *The Story of My Experiments with Truth*.
3. Maulana Abul Kalam Azad, (2017). *India Wins Freedom*, Create Space Independent Publishing Platform.
4. Romain Rolland, (1952). *The Life of Vivekananda and the Universal Gospel*, Advaita ashrama.

WEB SITES:

1. http://www.arvindguptatoys.com/arvindgupta/gandhiexperiments.pdf
2. http://www.sanipanhwar.com/India%20Wins%20Freedom%20%20Maulana%20Abul%20Kalam%20Azad
3. https://estudantedavedanta.net/The-Life-Of-Vivekananda-And-The-Universal-Gospel.pdf

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	-	-	2	1	-	-	-	-	-	-	-	3	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	
CO3	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	3	-	-	-	-	-	-	-	-	-	-	3	2	-
Average	-	-	**2**	**2**	**2**		**3**	-	-	-	-	-	-	-	**3**	**2.5**	-

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

Semester V

24ADU501 DIGITAL IDENTITY AND ACCESS MANAGEMENT 4H - 3C

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- 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.

COURSE OUTCOMES (COs):

At the end of this course, students will be able to explore multi-factor authentication (MFA) methods and principles

COs	Course Outcomes	Blooms Level
CO1	Classify 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	Construct and implement federated systems for secure access.	Apply

UNIT I DIGITAL SECURITY & GOVERNANCE 12 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 ControlSecurity 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, CoBlT.

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 Reviewand 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, SSO, AND FEDERATED SYSTEMS **12 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 **12 HOURS**

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

TEXT BOOKS **TOTAL: 60 HOURS**

1.Osmanoglu, E. (2013). *Identity and access management*.
2.Voglmaier, R. E. (2003). *The ABCs of LDAP*.
3.Penrose, J. F. (n.d.). *Multi-factor authentication: Strategies and implementation*.

REFERENCE BOOKS

1.Osborn, M. D. (n.d.). *Federated identity management: Concepts and practices*.
2.Peterson, L. E. (n.d.). *Single sign-on solutions: Security, implementation, and best practices.*

WEBSITES

1. http://www.tutorialspoint.com
2. https://www.javatpoint.com

CO, PO, PSO Mapping

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

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

Semester V

24ADU502 FUNDAMENTALS OF DATA SCIENCE 5H - 3C

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

End Semester Exam: 3 Hours

PREREQUISITE: Not Required

COURSE OBJECTIVES (CO):

The goal of this course is for the students

- To study the basic concepts of Data Science and data lifecycle.
- To understand the theoretical and mathematical aspects of Data Science models.
- To learn common random variables and their uses, and with the use of empirical distributions.

COURSE OUTCOMES (COs):

- At the end of this course, students will be able to explore the major techniques for data science.

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

UNIT I INTRODUCTION 12 HOURS

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

UNIT II SAMPLING 12 H0URS

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

UNIT III DATA NORMALIZATION 12 HOURS

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

UNIT IV MAJOR TECHNIQUES IN DATA SCIENCE **12 HOURS**

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

UNIT V BUSINESS INTELLIGENCE **12 HOURS**

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

TEXT BOOK **TOTAL: 60 HOURS**

1. Myatt, G. J., & Johnson, W. P. (2014). *Making sense of data I: A practical guide to exploratory data analysis and data mining* (2nd ed.). John Wiley & Sons
2. Saltz, J. S. (2019). *An introduction to data science* (2nd ed.). Sage Publications, Inc.
3. Haider, M. (2015). *Getting started with data science: Making sense of data with analytics* (1st ed.). IBM Press.

REFERENCE BOOK

1. Bruce, P., & Bruce, A. (2017). *Practical statistics for data scientists* (1st ed.). O'Reilly Media.
2. Griffiths, D. (2008). *Head first statistics* (1st ed.). O'Reilly Media.

WEBSITE

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

CO, PO, PSO Mapping

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

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

Semester V

24ADU503A DATA VISUALIZATION 4H - 3C

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

The objectives of this course is to make the learners to:

- Understand the process of connecting Tableau Desktop to diverse data sources.
- Know the customizing charts to effectively communicate analytical findings.
- Acquire the knowledge of table calculation functions to address complex analytical challenges.

COURSE OUTCOMES (COs):

Upon completion of this course students will be able to Know the common standard map views used to visualize geographical data in Tableau

COs	Course Outcomes	Blooms Level
CO1	Explain the connectivity of Tableau Desktop to various data sources.	Understand
CO2	Classify various chart types including text tables, maps, bar charts, line charts, area fill charts, pie charts, scatter plots, bullet graphs, and Gantt charts.	Understand
CO3	Build table calculation functions to solve complex analytical problems.	Apply
CO4	Summarize common standard map views to visualize geographical data.	Understand
CO5	Compare new data with forecasts to perform ad hoc analysis.	Analyze

UNIT I CREATING VISUAL ANALYTICS WITH TABLEAU 10 HOURS

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

UNIT II BUILDING YOUR FIRST VISUALIZATION 10 HOURS

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

UNIT III CREATING CALCULATIONS **10 HOURS**

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

UNIT IV USING MAPS TO IMPROVE INSIGHTS **9 HOURS**

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

UNIT V DEVELOPING AN ADHOC ANALYSIS **9 HOURS**

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

TEXT BOOK **TOTAL: 48 HOURS**

1. Murray, D. G., & the InterWorks BI team. (2019). *Tableau your data*. Wiley.
2. Milligan, J. N. (2019). *Learning Tableau* (3rd ed.). Packt Publishing.
3. Nandeshwar, A. (2018). *Tableau data visualization cookbook*. Packt Publishing

REFERENCE BOOK

1. Telea, A. C. (2017). *Data visualization: Principles and practice* (2nd ed.). CRC Press.
2. Iliinsky, N., & Steele, J. (2011). *Designing data visualizations: Representing informational relationships*. O'Reilly Media

WEBSITE

1. https://www.inferentialthinking.com/chapters/intro
2. https://www.openintro.org/stat
3. https://swayam.gov.in/nd1_noc19_cs60/preview

CO, PO, PSO Mapping

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CO2	3	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO3	3	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	1
CO5	3	-	2	-	2	-	-	-	-	-	-	-	-	-	-	-	-
Average	3	-	2	2	2	-	1	-	-	-	-	-	-	1	-	2	1.5

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

Semester V

24ADU503B COMPUTER GRAPHICS 4H - 3C

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

End Semester Exam: 3 Hours

PREREQUISITE: Not Required

COURSE OBJECTIVES (CO)

- This course presents an introduction to computer graphics designed to give the student an overview of fundamental principles.
- The course makes the student to understand about the video and raster scan displays and their storage
- Methods for modeling objects as polygonal meshes or smooth surfaces, and as rendering such as hidden-surface removal, shading, illumination, and shadows will be investigated.

COURSE OUTCOMES (COs):

Upon completion of the course, students will be able to make the student to understand the usage of input devices and its working

COs	Course Outcomes	Blooms Level
CO1	Extend of the structure of an interactive computer graphics system, and the separation of system components	Understand
CO2	Relate the geometrical transformations and 2D viewing	Understand
CO3	Interpret techniques for representing 3D geometrical objects	Understand
CO4	Demonstrate of the various clipping algorithms and visible surface detection algorithm	Apply
CO5	Organize Classification of Visible Surface Detection Algorithms	Apply

UNIT I A SURVEY OF COMPUTER GRAPHICS 1O HOURS

Video Display Devices- Refresh cathode-Ray Tubes-Raster Scan Displays-Random Scan Displays-Color CRT Monitors-Direct –View Storage Tubes-Flat Panel Displays-Raster Scan Systems-Three Dimensional Viewing Devices-Random Scan Systems

UNIT II INPUT DEVICES 1O HOURS

Keyboards-Mouse –Track Ball and Space ball-Joysticks-Data Glove- digitizers-Image Scanners-Touch Panels-Light Pens-Voice Systems-**Hard Copy Devices**: Printers and Plotters

UNIT III POINT AND LINES- LINE DRAWING ALGORITHMS 10 HOURS

DDA Algorithm- Bresenhams Line Algorithm. **Circle Generating Algorithms**: MidPoint Circle Algorithm. Two Dimensional Geometric Transformations: **Basic Transformations**: Translation-

Rotation-Scaling-**Composite Transformations**: Translations-Rotations- Scaling. General Pivot Point Rotation- General Fixed Point Scaling.

UNIT IV TWO DIMENSIONAL VIEWING 8 HOURS

The Viewing Pipeline- Window to view port Transformation-**Clipping Operations**-Point Clipping -Line Clipping: Cohen Sutherland Line Clipping. Polygon Clipping: Sutherland –Hodgeman Polygon Clipping-Text Clipping.

UNIT V THREE – DIMENSIONAL DISPLAY METHODS 10 HOURS

Parallel Projection- three Dimensional Geometric Transformations: Translation-Rotations-Scaling. **Projections**: Parallel Projections-Perspective Projections. **Visible Surface Detection Methods**: Classification of Visible Surface Detection Algorithms-Back Face Detection- Depth Buffer Method-Area Sub division Method.

TEXT BOOK **TOTAL: 48 HOURS**

1. Hughes, J. F., Van Dam, A., McGuire, M., Sklar, D. F., Foley, J. D., Feiner, S. K., & Akeley, K. (2018). *Computer graphics: Principles and practice*. Pearson.
2. Gordon, V. S. (2018). *Computer graphics programming in OpenGL with Java* (2nd ed.). Mercury.
3. Kessenich, J., Sellers, G., & Shreiner, D. (2016). *OpenGL programming guide: The official guide to learning OpenGL, version 4.5 with SPIR-V* (9th ed., Kindle ed.).

REFERENCE BOOK

1. Angel, E., & Shreiner, D. (2016). *Interactive computer graphics: A top-down approach with WebGL* (7th ed.).

WEBSITE

1. www.cgshelf.com
2. www.cgtutorials.com
3. www.allgraphicdesign.com
4. https://nptel.ac.in/courses/106/102/106102063/

CO, PO, PSO Mapping

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

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

Semester V

24ADUA504 RESOURCE MANAGEMENT TECHNIQUES 4H - 3C

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- Understanding the Fundamentals of Operations Research.
- Understand the significance of slack and surplus variables.
- Understand the computational procedure of the Simplex Method.
-

COURSE OUTCOMES (COs):

At the end of this course, students will be able to Understand the mathematical formulation of transportation problems

COs	Course Outcomes	Blooms Level
CO1	Define and explain the concept and scope of Operations Research.	Understand
CO2	Use graphical methods to solve linear programming problems, incorporating slack and surplus variables.	Analyze
CO3	Relate the computational procedure of the Simplex Method to solve linear programming problems.	Understand
CO4	Formulate and solve assignment problems using appropriate mathematical methods.	Apply
CO5	Make use of various methods to find the Initial Basic Feasible Solution (IBFS) for transportation problems.	Apply

UNIT I **10 HOURS**

Development of OR: Definition of OR – Modeling - Characteristics and Phases - Tools, Techniques & Methods - scope of OR

UNIT II **10 HOURS**

Linear Programming Problem: Formulation - Slack & surplus variables - Graphical solution of LPP.

UNIT III **10 HOURS**

Simplex Method: Computational Procedure - Big-M method - Concept of duality in LPP - Definition of primal dual problems - General rules for converting any primal into its dual.

UNIT IV **9 HOURS**

Duality Theorems: (without proof) Primal dual correspondence - Duality and Simplex method - Mathematical formulation of assignment problem - Method for solving assignment problem.

UNIT V **9 HOURS**

Mathematical formulation of Transportation Problem: Methods for finding IBFS for the Transportation Problems.

TEXT BOOK: **TOTAL: 48 HOURS**

1. Sharma, S. D. (n.d.). *Operations research*. Kedar Nath Ram Nath & Co.

REFERENCE BOOKS:

1. Taha, H. A. (2017). *Operations research: An introduction* (10th ed., Global ed.). Pearson.
2. Shah, N. H., Gor, R. M., & Hardiksoni. (2008). *Operations research*. Prentice Hall of India Pvt. Ltd.
3. Sivarethinamohan, R. (2005). *Operations research*. Tata McGraw-Hill.
4. Taha, H. A. (2012). *Operations research: An introduction* (9th ed.). Dorling Kindersley Pvt. Ltd.

CO, PO, PSO Mapping

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

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

Semester V

24ADU511 FUNDAMENTALS OF DATA SCIENCE – PRACTICAL 4H - 2C

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To study the basic concepts of Data Science and data lifecycle.
- To understand the theoretical and mathematical aspects of Data Science models.
- To learn common random variables and their uses, and with the use of empirical distributions.

COURSE OUTCOMES (COS):

- At the end of this course, students will be able to explore the major techniques for data science.

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

LIST OF PROGRAMS

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

TOTAL :48 HOURS

TEXTBOOKS

1. Myatt, G. J., & Johnson, W. P. (2014). *Making sense of data I: A practical guide to exploratory data analysis and data mining* (2nd ed.). John Wiley & Sons.
2. Saltz, J. S. (2019). *An introduction to data science* (2nd ed.). Sage Publications, Inc.
3. Haider, M. (2015). *Getting started with data science: Making sense of data with analytics* (1st ed.). IBM Press.

REFERENCE BOOKS

1. Bruce, P., & Bruce, A. (2017). *Practical statistics for data scientists* (1st ed.). O'Reilly Media.
2. Griffiths, D. (2008). *Head first statistics* (1st ed.). O'Reilly Media.

WEBSITES

1 https://www.inferentialthinking.com/chapters/intro

2 https://www.openintro.org/stat/

3 https://swayam.gov.in/nd1_noc20_cs36/preview

4 https://swayam.gov.in/nd1_noc19_cs60/preview

CO, PO, PSO Mapping

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

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

Semester V

24ADU512A DATA VISUALIZATION– PRACTICAL 5H - 2C

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- Know the techniques for optimizing data connections for efficient data retrieval.
- Customize the appearance and formatting of univariate charts.
- See the relationships between multiple variables using visualizations.
-

COURSE OUTCOMES (COS):

- Upon completion of this course students will be able to Know the visualization techniques to export data from Tableau.

COs	Course Outcomes	Blooms Level
CO1	Infer techniques for optimizing data connections for efficient data retrieval	Understand
CO2	Customize the appearance and formatting of univariate charts for clear communication of insights.	Analyze
CO3	Compare relationships between multiple variables using visualizations.	Understand
CO4	Develop techniques for visualizing spatial data and geographic distributions effectively	Apply
CO5	Select the visualization techniques to export data from Tableau for further analysis in external tools.	Apply

LIST OF PROGRAMS

1. Connect to data Sources

2. Create Univariate Charts

3. Create Bivariate and Multivariate charts

4. Create Maps

5. Calculate user-defined fields

6. Create a workbook data extract

7. Save a workbook on a Tableau server and web

8. Export images, data.

TOTAL:60 HOURS

TEXTBOOKS:

1. Murray, D. G., & the InterWorks BI team. (2019). *Tableau your data*. Wiley.
2. Milligan, J. N. (2019). *Learning Tableau* (3rd ed.). Packt Publishing.
3. Nandeshwar, A. (2018). *Tableau data visualization cookbook*. Packt Publishing.
4. Telea, A. C. (2017). *Data visualization: Principles and practice* (2nd ed.). CRC Press.

REFERENCE BOOKS:

1. .Iliinsky, N., & Steele, J. (2011). *Designing data visualizations: Representing informational relationships*. O'Reilly Media.

2. Nussbaumer Knaflic, C. (2014). *Storytelling with data: A data visualization guide for business professionals*. Wiley.

WEBSITES:

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

CO, PO, PSO Mapping

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

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

Semester V

24ADU512B COMPUTER GRAPHICS - PRACTICAL 5H - 2C

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVE (CO)

- To working knowledge of a modern 3D graphics library via practical assignments
- To ability to produce usable graphics user-interfaces
- To ability to manipulate 3D objects in virtual environments

COURSE OUTCOMES (COS):

Upon completion of this course students will be able to write programs from a practical specification and produce realistic graphics outputs

COs	Course Outcomes	Blooms Level
CO1	The outcome of this course will enable the students to work in 2D,3D geometric transformation.	Understand
CO2	Contrast students to work on Line clipping, polygon clipping and text clipping.	Analyze
CO3	Translate the students to understand the concept in 2D and 3D Translation, Scaling and rotation.	Understand
CO4	Plan and enable working in various line algorithm.	Apply
CO5	make the students to implement in shearing and reflection of an object.	Apply

LIST OF EXPERIMENTS:

1. Program to draw a line using DDA algorithm.
2. Program to draw a line using Bresenham‟s algorithm.
3. Program to draw a circle using Bresenham‟s algorithm.
4. Program to implement the Character generation algorithm.
5. Program to implement the Polygon clipping alogorithm.
6. Program to implement the Text clipping algorithm.
7. Program to implement the line Clipping algorithm.
8. Program to implement the 2D Translation, 2D Rotation and 2D scaling.
9. Program to implement the 3D Translation, 3D Rotation and 3D scaling.
10. Program to implement the Shearing and Reflection of an object.

TOTL: 60 HOURS

TEXT BOOK

1. Hughes, J. F., Van Dam, A., McGuire, M., Sklar, D. F., Foley, J. D., Feiner, S. K., & Akeley, K. (2018). *Computer graphics: Principles and practice*. Pearson.
2. Gordon, V. S. (2018). *Computer graphics programming in OpenGL with Java* (2nd ed.). Mercury.
3. Kessenich, J., Sellers, G., & Shreiner, D. (2016). *OpenGL programming guide: The official guide to learning OpenGL, version 4.5 with SPIR-V* (9th ed., Kindle ed.).

REFERENCE BOOKS

1. Angel, E., & Shreiner, D. (2014). *Interactive computer graphics: A top-down approach with WebGL* (7th ed.).
2. Hearn, D., & Baker, M. P. (2007). *Computer graphics: C version* (2nd ed.). Pearson Education.

WEBSITES

1. www.cgshelf.com
2. www.cgtutorials.com
3. www.allgraphicdesign.com
4. https://nptel.ac.in/courses/106/102/106102063/

CO, PO, PSO Mapping

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

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

SEMESTER V

24ADUE501X	**ELECTIVE MAJOR**	**4H - 3C**

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

End Semester Exam: 3 Hours

SEMESTER V

24ADU591	**INTERNSHIP**	**H - 2C**

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

End Semester Exam: 3 Hours

SEMESTER VI

24ADU601 SOFTWARE ENGINEERING 6H - 5C

Instruction Hours / Week: L:6 T:0 P:0 **Marks:** Internal**: 40** External**: 60 T**otal**: 100**

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

The objectives of this course is to make the learners to:

- Describe the fundamental concepts of software engineering.
- Analyze, specify and document Software Requirements Specifications (SRS) for a software system.
- Illustrate the risk management and data design engineering at the Architectural level and Component level.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Demonstrate the Software Engineering Principles with the significance of frameworks and models.	Understand
CO2	Classify the Software Requirements Specifications (SRS) for successful project planning and scheduling	Analyze
CO3	Relate the risk management and design engineering.	Understand
CO4	Interpret the types of testing strategies	Understand
CO5	Extend the Automation Testing Frameworks using Selenium Tool.	Understand

UNIT I INTRODUCTION 15 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 15 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 RISK MANAGEMENT & DESIGN ENGINEERING 15 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 15 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 AUTOMATION TESTING BASICS 12 HOURS

Introduction of selenium- Selenium components- Overview of the Testing framework- Selenium Architecture- Selenium Features- Selenium IDE- IDE-Features- IDE Commands - IDE-First Test Case-Selenium Web Driver- Web Driver-Architecture- Web Driver-Features- WebDriver Commands- Locating Strategies

TOTAL: 72 HOURS

TEXT BOOKS:

1. Pressman, R. S. (2019). *Software engineering: A practitioner's approach* (7th ed.). McGraw-Hill.
2. Mathur, A. P. (2018). *Foundations of software testing: Fundamental algorithms and techniques*. Pearson Education, Dorling Kindersley (India) Pvt. Ltd.
3. Jalote, P. (2018). *An integrated approach to software engineering* (2nd ed.). New Age International Publishers.

REFERENCE BOOKS:

1. Aggarwal, K. K., & Singh, Y. (2017). *Software engineering* (2nd ed.). New Age International Publishers..
2. Sommerville, I. (2016). *Software engineering* (8th ed.). Addison Wesley.
3. Crispin, L., & Gregory, J. (2015). *Agile testing: A practical guide for testers and agile teams*. Addison-Wesley.

WEBSITES:

1. http://en.wikipedia.org/wiki/Software_engineering
2. http://www.onesmartclick.com/engineering/software-engineering.html
3. https://www.javatpoint.com/selenium-tutorial
4. https://nptel.ac.in/courses/106105087/
5. http://qascript.com/free-selenium-webdriver-ebook/

CO, PO, PSO Mapping

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

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

SEMESTER VI

24ADU602A MACHINE LEARNING 6H - 4C

Instruction Hours / Week: L:6 T:0 P:0 **Marks:** Internal**: 40** External**: 60 T**otal**: 100**

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- 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**.**

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Infer theory of machine learning components and models	Understand
CO2	Characterize the algorithms of machine learning to learn linear and non-linear models	Analyze
CO3	Infer data clustering algorithms for machine learning process	Understand
CO4	Translate machine learning algorithms to learn tree and rule-based models	Understand
CO5	Inspect reinforcement machine learning techniques for robotics	Analyze

UNIT I FOUNDATIONS OF LEARNING 15 HOURS

Components of learning – learning models – geometric models – probabilistic models – logic models – grouping and grading – learning versus design – types of learning – supervised – unsupervised – reinforcement – theory of learning – feasibility of learning – error and noise – training versus testing – theory of generalization – generalization bound –bias andvariance – learning curve

UNIT II LINEAR MODELS 15 HOURS

Linear classification – univariate linear regression – multivariate linear regression – regularized regression – Logistic regression – perceptrons – multilayer neural networks – learning neural networks structures – support vector machines – soft margin SVM – generalization and over fitting – regularization – validation

UNIT III DISTANCE-BASED MODELS 15 HOURS

Nearest neighbour models – K-means – clustering around medoids – silhouttes– hierarchical clustering – k- d trees – locality sensitive hashing – non - parametric regression – ensemble learning – bagging and random forests – boosting – meta silhouttes – hierarchical clustering – k- d trees – locality sensitive hashing – non - parametric regression – ensemble learning – bagging and random forests – boosting – meta learning

UNIT IV TREE AND RULE MODELS **15 HOURS**

Decision trees – learning decision trees – ranking and probability estimation trees –Regression trees – clustering trees – learning ordered rule lists – learning unordered rule lists – descriptive rule learning – association rule mining – first -order rule learning

UNIT V REINFORCEMENT LEARNING **12 HOURS**

Passive reinforcement learning – direct utility estimation – adaptive dynamic programming – temporal - difference learning – active reinforcement learning – genetic algorithm for Reinforcement Learning- exploration – learning an action utility function – Generalization in reinforcement learning – policy search – applications in game playing – applications in robot control

TOTAL: 72 HOURS

TEXT BOOKS:

1. Mitchell, T. M. (2019). *Machine learning*. Tata McGraw Hill Publications.
2. Abu-Mostafa, Y. S., Magdon-Ismail, M., & Lin, H.-T. (2018). *Learning from data*. AMLBook Publishers.
3. Flach, P. (2017). *Machine learning: The art and science of algorithms that make sense of data*. Cambridge University Press.

REFERENCE BOOKS:

1. Murphy, K. P. (2017). *Machine learning: A probabilistic perspective*. MIT Press.
2. Barber, D. (2015). *Bayesian reasoning and machine learning*. Cambridge University Press.

WEBSITES:

1. https://machinelearningmastery.com/linear-regression-for-machine-learning/
2. https://www.cambridge.org/core/books/machine-learning/distancebased-models/
3. https://dzone.com/articles/machine-learning-with-decision-trees
4. http://reinforcementlearning.ai-depot.com/
5. https://nptel.ac.in/courses/106106139/
6. https://swayam.gov.in/nd1_noc19_cs81/preview

CO, PO, PSO Mapping

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

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

SEMESTER VI

24ADU602B BIG DATA ANALYTICS 6H - 4C

Instruction Hours / Week: L:6 T:0 P:0 **Marks:** Internal**:** External**: T**otal**:**

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- Understand the evolution and scope challenges of Data Management in Big Data.
- Learn the principles of data management to handle Big Data effectively
- Understand the suitability of different Big Data technologies for specific use cases.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Demonstrate the Evolution of Data Management in Big Data.	Understand
CO2	Assume the principles of data management to handle Big Data effectively	Analyze
CO3	Illustrate the suitability of different Big Data technologies for specific use cases	Understand
CO4	Inspect Big Data Solutions for execute Map Reduce jobs for processing large datasets	Analyze
CO5	List the techniques to ensure the scalability and responsiveness of real-time analytics solutions	Analyze

UNIT I INTRODUCTION TO BIG DATA 15 HOURS

Evolution of Big data - Best Practices for Big data Analytics - Big data characteristics Validating – The Promotion of the Value of Big Data - Big Data Use Cases- Characteristics of Big Data Applications - Perception and Quantification of Value -Understanding Big Data Storage - A General Overview of High - Performance Architecture - HDFS - MapReduce and YARN - Map Reduce Programming Model

UNIT II CLUSTERING AND CLASSIFICATION 15 HOURS

Advanced Analytical Theory and Methods: Overview of Clustering - K-means - Use Cases - Overview of the Method - Determining the Number of Clusters - Diagnostics - Reasons to Choose and Cautions.

Classification: Decision Trees - Overview of a Decision Tree - The General Algorithm - Decision Tree Algorithms - Evaluating a Decision Tree - Decision Trees in R - Naïve Bayes - Bayes Theorem - Naïve Bayes Classifier.

UNIT III ASSOCIATION AND RECOMMENDATION SYSTEM 15 HOURS

Advanced Analytical Theory and Methods: Association Rules - Overview - Apriori Algorithm – Evaluation of Candidate Rules - Applications of Association Rules - Finding Association&finding similarity -

Recommendation System: Collaborative Recommendation- Content Based Recommendation - Knowledge Based Recommendation- Hybrid Recommendation Approaches.

UNIT IV STREAM MEMORY **15 HOURS**

Introduction to Streams Concepts – Stream Data Model and Architecture - Stream Computing, Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating moments – Counting oneness in a Window – Decaying Window – Real time Analytics Platform (RTAP) applications

UNIT V NOSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATION 12 HOURS

NoSQL Databases: Schema-less Models‖: Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores - Tabular Stores - Object Data Stores - Graph Databases Hive - Sharding –- Hbase – Analyzing big data with twitter - Big data for E-Commerce Big data for blogs - Review of Basic Data Analytic Methods using R.

TEXTBOOKS: **TOTAL: 72 HOURS**

1. Loshin, D. (2019). *Big data analytics: From strategic planning to enterprise integration with tools, techniques, NoSQL, and graph*. Morgan Kaufmann/Elsevier.
2. EMC Education Services. (2018). *Data science and big data analytics: Discovering, analyzing, visualizing, and presenting data*. Wiley.
3. Baesens, B. (2017). *Analytics in a big data world: The essential guide to data science and its applications*. Wiley.

REFERENCE BOOKS:

1. Jannach, D., & Zanker, M. (2017). *Recommender systems: An introduction*. Cambridge University Press.
2. Pries, K. H., & Dunnigan, R. (2016). *Big data analytics: A practical guide for managers*. CRC Press.
3. Lin, J., & Dyer, C. (2015). *Data-intensive text processing with MapReduce*. *Synthesis Lectures on Human Language Technologies, 3*(1), 1-177. Morgan & Claypool Publishers.

WEBSITES:

1. https://www.ibm.com/analytics/big-data-analytics
2. https://www.simplilearn.com/what-is-big-data-analytics-article

CO, PO, PSO Mapping

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

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

SEMESTER VI

24ADU612A MACHINE LEARNING- PRACTICAL 4H - 2C

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

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- 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**.**

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Rephrase theory of machine learning components and models	Understand
CO2	Explain the algorithms of machine learning to learn linear and non-linear models	Evaluate
CO3	simplify data clustering algorithms for machine learning process	Analyze
CO4	Construct machine learning algorithms to learn tree and rule-based models	Apply
CO5	Examine reinforcement machine learning techniques for robotics	Apply

List of Programs:

1. Implement Decision Tree learning
2. Implement Logistic Regression
3. Implement classification using Multilayer perceptron
4. Implement classification using SVM
5. Implement Adaboost
6. Implement Bagging using Random Forests
7. Implement K-means, K-Modes Clustering to Find Natural Patterns in Data
8. Implement Hierarchical clustering

TOTAL : 48 HOURS

TEXT BOOKS:

1. Tom.M.Mitchell (2019), *Machine Learning*, Tata McGraw Hill Publications
2. Y. S. Abu - Mostafa, M. Magdon-Ismail, and H.-T. Lin. (2018). *Learning from Data*, AML Book Publishers.

REFERENCE BOOKS:

1. P. Flach. (2017). *Machine Learning: The art and science of algorithms that make sense of data*, Cambridge University Press.
2. K. P. Murphy. (2017). *Machine Learning: A Probabilistic Perspective*, MIT Press,
3. D. Barber. (2015). *Bayesian Reasoning and Machine Learning*, Cambridge University Press.

WEB SITES:

1. https://machinelearningmastery.com/linear-regression-for-machine-learning/
2. https://www.cambridge.org/core/books/machine-learning/distancebased-models/
3. https://dzone.com/articles/machine-learning-with-decision-trees
4. http://reinforcementlearning.ai-depot.com/
5. https://nptel.ac.in/courses/106106139/
6. https://swayam.gov.in/nd1_noc19_cs81/preview

CO, PO, PSO Mapping

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

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

SEMESTER VI

24ADU612B BIG DATA ANALYTICS-PRACTICAL 4H - 2C

Instruction Hours / Week: L:0 T:0 P:4 **Marks:** Internal**:** External**: T**otal**:**

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To know the fundamental concepts of big data and analytics.
- To explore tools and practices for working with big data
- To learn about stream computing.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Demonstrate the fundamental concepts of big data and analytics	Understand
CO2	Develop with big data tools and its analysis techniques	Apply
CO3	Classify the data by utilizing clustering and classification algorithms	Analyze
CO4	Plan and apply different mining algorithms and recommendation systems for large volumes of data	Apply
CO5	Construct and Perform analytics on data streams	Apply

LIST OF PROGRAMS

1. Set up a pseudo-distributed, single-node Hadoop cluster backed by the Hadoop Distributed File System, running on Ubuntu Linux. After successful installation on one node, configuration of a multi-node Hadoop cluster (one master and multiple slaves).
2. MapReduce application for word counting on Hadoop cluster
3. Unstructured data into NoSQL data and do all operations such as NoSQL query with API.
4. K-means clustering using map reduce
5. Page Rank Computation
6. Mahout machine learning library to facilitate the knowledge build up in big data analysis.
7. Application of Recommendation Systems using Hadoop/mahout libraries

TOTAL: 48 HOURS

TEXT BOOKS:

1. David Loshin. (2019). *Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph*, Morgan Kaufmann/Elsevier Publishers.
2. EMC Education Services. (2018). *Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data.* Wiley publishers.
3. Bart Baesens . (2017). *Analytics in a Big Data World: The Essential Guide to Data Science and its Applications*, Wiley Publishers.
4. Dietmar Jannach and Markus Zanker. (2017). *Recommender Systems: An Introduction*. Cambridge University Press.

REFERENCE BOOKS:

1. Kim H. Pries and Robert Dunnigan. (2016). *Big Data Analytics: A Practical Guide for Managers* " CRC Press.
2. Jimmy Lin and Chris Dyer. (2015). *Data-Intensive Text Processing with MapReduce*", Synthesis Lectures on Human Language Technologies, Vol. 3, No. 1, Pages 1-177, Morgan Claypool publishers.

WEBSITES:

1. https://www.ibm.com/analytics/big-data-analytics
2. https://www.simplilearn.com/what-is-big-data-analytics-article

CO, PO, PSO Mapping

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

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

SEMESTER VI

24ADUEA601X	**ELECTIVE MINOR**	**6H - 3C**

Instruction Hours / Week: L:6 T:0 P:0 **Marks:** Internal**: 40** External**:60 T**otal**:100**

End Semester Exam: 3 Hours

SEMESTER VI

24ADU691	**PROJECT**	**8H - 6C**

Instruction Hours / Week: L:8 T:0 P:0 **Marks:** Internal**: 40** External**: 60 T**otal**: 100**

SEMESTER VI

ECA / NCC / NSS / SPORTS / GENERAL INTEREST ETC **H - 2C**

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

End Semester Exam: 3 Hours

I YEAR

Orientation – NSS origin – motto – symbol – NSS administration at different levels – programme planning – Rural Projects – Urban projects – Government schemes – Career guidance – Self help groups – Environment protection – Use of natural energy – Conventional energy resources – Soil and Water conservation – Community health programmes – Women and child welfare – Education for all.

II YEAR

Popularization of agro techniques – Self employment opportunities – Animal health, Dairy and Poultry farming – Road safety – Training on First aid and emergency cell. Popularization of small savings – communal harmony and National integration – Care of Senior citizens – Personality development – meditation, Yoga Art of living – Activities on the preservation of National monuments, cultural heritage and folklore – special camp activities

PRACTICAL SCHEDULE

Semester-I

1. Orientation of NSS volunteers and programme coordinator and Programme officers.
2. Origin of NSS in India and its development
3. NSS motto, symbol and NSS awards
4. Organizational set up of NSS at Central, State University and college levels.
5. Programme planning – Theme of the year – planning implementation at PC, PO and NSS volunteer level.
6. Visit to selected village - gathering basic data on socio economic status.
7. Participatory rural appraisal – studying the needs of the target group.
8. Visit of urban slum and gathering data on socio economic status.
9. Self involvement and methods of creating rapport with the target group.
10. Awareness campaign on welfare schemes of the central and state government.
11. Formation career guidance group with NSS volunteers and students welfare unit
12. Cycle rally on environmental protection.
13. Campus development activities – clean environment campaign, formation of plastic free zones.
14. Campus development,
15. Tree planting maintenance and greening

16. Campus cleaning.
17. FINAL EXAMINATION.

Semester - II

1. Motivation of rural and urban youth for formation of SHG (Self Help Groups) in collaboration with Government machineries and NGOs.
2. Campaign on ill effects of plastics in the adjoining campus areas – Villages / urban areas.
3. Campaign on *Parthenium* eradication.
4. Cycle rally on air pollution – Vehicle exhaust and other means.
5. Popularization of biogas and smokeless chulah.
6. Demonstration on the use of wind energy and solar energy.
7. Demonstration of water harvesting techniques.
8. Demonstration on soil conservation techniques wherever possible.
9. Campaign on Community health programmes of central and state Government – involving Health department officials.
10. AIDS awareness campaign ; campaign on diabetes and healthy food habits and drug abuse
11. Planing formation of blood donors club – involving NGOs.
12. Campaign on gender equality and women empowerment.
13. Campaign on child health care – immunization, food habits and child labour abolition.

III Semester

1. Conducting field days with KVK to popularize improved agro techniques.
2. Conducing seminar / workshop in a nearby village to motivate the youth on agribusiness (involving DEE, KVK, NGO and local agripreneurs).

3–5 Campaign on self employment opportunities like Apiculture, mushroom cultivation, Food processing and value addition, production of biocontrol agents and biofertilizers, nursery techniques, seed production, tissue culture, vermicompost, manufacture of small gadgets and agricultural implements as per local needs and feasibility.

6. Animal health care campaign – Dairy and poultry farming - Forage production techniques and silage making.
7. Training the NSS volunteers on road safety measures in involving traffic wardens and RTO.
8. Training NSS volunteers on First AID and emergency call involving NGOs and organizations like St. John's Ambulance, Red Cross, etc.,
9. Organizing Road safety rally.
10. Motivating NSS Volunteers on small savings concept and conveying the message to the public through them.

12. Observation of National integration and communal harmony. 14 – 16 : Campus development and greening activities

4. Examination.

Semester-IV

1 – 3 : Visit to orphanages and old age homes to look after their needs.

4. Personality development programmes – Building up self confidence in youth.

5 – 7 : Teaching NSS volunteers on mediation Yoga and art of healthy living with trained teachers

8 – 9 : Visit of nearby National Monument / Places of tourist importance and campaign on cleanliness and preservation.

10–11 : Exploration of hidden talents of village youth and public on folklore, traditional art, sports, martial arts and cultural heritage.

12–13. Campus improvement activities

14–16 : Visit to special camp village and pre camp planning.

5. Examination

- Besides the above NSS volunteers will attend work during important occasions like Convocation, Farmers day, Sports meet and other University / College functions. NSS Volunteers will attend one special camp in the selected village for a duration of 10 days and undertake various activities based on the need of that village people.
- For all out door regular activities villages / slums nearby the campus may be selected to avoid transport cost (Cyclable distance)
- Special camp activity may be carried out in a village situated within a radius of 15 – 20 KM.

EVALUATION

A. Regular activities	Marks(60)
I Semester	15
II Semester	15
III Semester	15
IV Semester	15

* (Written test 10 marks and attendance 5 marks) 80% attendance compulsary

B. Special camping activities	Marks(40)
a. Attendance in daily activities(marks During special camp)	30
b.Special camp activity report	5
Viva - voce on the 7th day(special camp)	5

SEMESTER VII

24ADU701 DEEP LEARNING 6H - 4C

Instruction Hours / Week: L:6 T:0 P:0 **Marks:** Internal**: 40** External**: 60 T**otal**: 100**

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To Understanding the basics concepts of deep learning.
- To Emphasizing knowledge on various deep learning algorithms.
- To Provide Understanding of CNN and RNN to model for real world applications

COURSE OUTCOMES (COs):

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

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

UNIT I INTRODUCTION TO NEURAL NETWORKS 15 HOURS

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

UNIT II FEED FORWARD NEURAL NETWORKS 15 HOURS

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

UNIT III CONVOLUTION NEURAL NETWORKS 15 HOURS

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

UNIT IV RECURRENT NEURAL NETWORKS 15 HOURS

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

UNIT V CASE STUDIES USING CNN & RNN **12 HOURS**

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

TOTAL: 72 HOURS

TEXT BOOKS:

1. NavinKumarManaswi. (2018). *Deep Learning with Applications Using Python*, Apress, 1st Edition.
2. Francois Chollet. (2018). *Deep Learning with Python, Manning Publications*, 1st Edition.
3. RagavVenkatesan,Baoxin Li. (2018).*Convolution Neural Networks in Visual Computing*, CRC Press, 1st Edition.

REFERENCE BOOKS:

1. Ian Good Fellow, YoshuaBengio and Aaron Courville. (2017). *Deep Learning*, MIT Press, 1st Edition
2. Phil Kim. (2017). *Matlab Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence*, APress,3rd Edition.
3. Joshua F. Wiley, R . (2016). *Deep Learning Essentials*, Packt Publications, 1st Edition.

WEBSITES :

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

CO, PO, PSO Mapping

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

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

SEMESTER VII

24ADU702 NATURAL LANGUAGE PROCESSING 6H - 4C

Instruction Hours / Week: L:6 T:0 P:0 **Marks:** Internal**: 40** External**: 60 T**otal**: 100**

End Semester Exam: 3 Hours

PREREQUISITE:

Not required

COURSE OBJECTIVES (CO):

- To introduce the fundamental concepts and techniques of natural language processing (NLP)
- To understanding of the models and algorithms in the field of NLP.
- To demonstrate the computational properties of natural languages and

COURSE OUTCOMES (COs):

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

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

UNIT I INTRODUCTION TO NLP 15 HOURS

Introduction – Models -and Algorithms - The Turing Test -Regular ExpressionsBasic Regular Expression Patterns -Finite State Automata -Regular Languages andFSAs – Morphology -Inflectional Morphology - Derivational Morphology – Finite – StateMorphological Parsing - Combining an FST Lexicon and Rules -Porter Stemmer

UNIT II N-GRAMS MODELS 15 HOURS

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

UNIT III CONTEXT FREE GRAMMARS **15 HOURS**

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

UNIT IV REPRESENTING MEANING **15 HOURS**

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

UNIT V DISCOURSE **12HOURS**

Discourse -Reference Resolution - Text Coherence -Discourse Structure - Dialog andConversational Agents - Dialog Acts – Interpretation – Coherence –ConversationalAgents - Language Generation – Architecture -Surface Realizations – DiscoursePlanning – Machine Translation -Transfer Metaphor – Interlingua – StatisticalApproaches.

TOTAL: 72 HOURS

TEXT BOOKS:

1. D. Jurafsky and J. Martin. (2020). *Speech and Language Processing: An Introductionto*
   Natural Language Processing, Computational Linguistics, and Speech Recognition.
2. Steven Bird, Ewan Klein, and Edward Loper.(2019). *Natural Language Processing with Python*, O'Reilly Publishers.
3. Ian H Written and Elbef, MarkA.Hall. (2013). *Data mining: Practical Machine Learning Tools and Techniques*,Morgan Kaufmann Publishers.

WEBSITES :

1. https://onlinecourses.swayam2.ac.in/aic20_sp06/preview
2. https://onlinecourses.swayam2.ac.in/arp19_ap79/preview
3. https://www.tutorialspoint.com/natural_language_processing/index.htm
4. www.kaggle.com/learn/intro-to-deep-learning

CO, PO, PSO Mapping

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

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

SEMESTER VII

24ADUA701 STATISTICAL COMPUTING 6H - 4C

Instruction Hours / Week: L:6T:0 P:0 **Marks:** Internal**: 40** External**: 60 T**otal**: 100**

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- 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.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Extend the principles of census and sample surveys and to become competent for conducting sample surveys.	Understand
CO2	Construct 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	Organize the difference between parametric and non-parametric tests**.**	Apply
CO4	Solve the difference between one way and two-way ANOVA.	Apply
CO5	Classify the basic of Statistical Quality Control and its tools	Analyze

UNIT I BASICS OF PROBABILITY 15 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 15 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 14 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 14 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 **14 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.

TOTAL: 72 HOURS

TEXT BOOKS:

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). *Statistics for Management*, 2nd Edition, McGraw HillEducation, New Delhi.
4. Sheldon Ross., (2007). *Introduction to Probability Model*, Ninth Edition, Academic Press, Indian Reprint.

REFERENCE BOOKS:

1. Robert V. Hogg, Joseph W. McKean and Allen T. Craig., (2007). *Introduction to Mathematical Statistics*, Pearson Education, Asia.
2. Irwin Miller and Marylees Miller, John E. Freund, (2006). *Mathematical Statistics with Application*, Seventh Edition, Pearson Education, Asia.
3. 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

CO, PO, PSO Mapping

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

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

SEMESTER VII

24ADU711 DEEP LEARNING – PRACTICAL 6H - 4C

Instruction Hours / Week: L:0 T:0 P:6 **Marks:** Internal**: 40** External**: 60 T**otal**: 100**

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To Understanding the basics concepts of deep learning.
- To Emphasizing knowledge on various deep learning algorithms.
- To Provide Understanding of CNN and RNN to model for real world applications

COURSE OUTCOMES (COs):

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

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

LIST OF PROGRAMS

1. Implement Simple Programs like vector addition in TensorFlow.
2. Implement a simple problem like regression model in Keras.
3. Implement a perceptron in TensorFlow/Keras Environment.
4. Implement a Feed-Forward Network in TensorFlow/Keras.
5. Implement an Image Classifier using CNN in TensorFlow/Keras.
6. Implement a Transfer Learning concept in Image Classification.
7. Implement an Autoencoder in TensorFlow/Keras.
8. Implement a Simple LSTM using TensorFlow/Keras.
9. Implement an Opinion Mining in Recurrent Neural network.
10. Implement an Object Detection using CNN.

TOTAL: 72 HOIURS

TEXT BOOKS:

1. Navin Kumar Manaswi. (2018). *Deep Learning with Applications Using Python*, Apress, 1st Edition.
2. Francois Chollet. (2018). *Deep Learning with Python, Manning Publications*, 1st Edition.
3. Ragav Venkatesan, Baoxin Li. (2018). *Convolution Neural Networks in Visual Computing*, CRC Press, 1st Edition.
4. Ian Good Fellow, YoshuaBengio and Aaron Courville. (2017). *Deep Learning*, MIT Press, 1stEdition

REFERENCE BOOKS:

1. Phil Kim. (2017). *Matlab Deep Learning: With Machine Learning*, Neural Networks and Artificial Intelligence, APress,3rd Edition.
2. Joshua F. Wiley, R . (2016). *Deep Learning Essentials*, Packt Publications, 1st Edition.

WEBSITES:

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

CO, PO, PSO Mapping

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

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

SEMESTER VII

24ADU712 NATURAL LANGUAGE PROCESSING – PRACTICAL 6H - 4C

Instruction Hours / Week: L:0 T:0 P:6 **Marks:** Internal**: 40** External**: 60 T**otal**: 100**

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To introduce the fundamental concepts and techniques of natural language processing (NLP)
- To understanding of the models and algorithms in the field of NLP.
- To demonstrate the computational properties of natural languages and

COURSE OUTCOMES (COs):

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

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

LIST OF PROGRAMS

1. Implementing word similarity
2. Implementing simple problems related to word disambiguation
3. Simple demonstration of part of speech tagging
4. Lexical Analyzer
5. Semantic Analyzer
6. Sentiment Analysis

TOTAL: 72 HOURS

TEXT BOOKS:

1. D. Jurafsky and J. Martin. (2020). *Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition*.
2. Steven Bird, Ewan Klein, and Edward Loper.(2019). *Natural Language Processing with Python*, O'Reilly Publishers.
3. Ian H Written and Elbef, MarkA.Hall. (2013). *Data mining: Practical Machine Learning Tools and Techniques*,Morgan Kaufmann Publishers.

WEBSITES:

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

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	-	2	-	2	3	-	-	-	-	-	-	-	-	3	3
CO2	3	-	-	-	-	2	-	-	-	-	-	-	-	-	-	1	-
CO3	3	-	-	2	-	1	-	-	1	-	-	-	-	-	-	-	2
CO4	3	2	-	-	-	1	-	-	-	-	-	-	-	-	-	-	2
CO5	3	-	-	1	-	2	-	-	-	-	-	-	-	-	-	-	-
Average	3	2	-	1.7	-	1.6	3	-	1	-	-	-	-	-	-	2	2.3

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

SEMESTER VIIIA

24ADU801A FULL STACK DEVELOPMENT 6H - 4C

Instruction Hours / Week: L:6 T:0 P:0 **Marks:** Internal**: 40** External**: 60 T**otal**: 100**

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO)

- To understand the various components of full stack development.
- To learn Node.js features and applications
- To develop applications with MongoDB.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Relate the various stacks available for web application development.	Understand
CO2	Plan and use the Node.js for application development	Apply
CO3	Develop applications with MongoDB	Create
CO4	Infer the features of Angular and Express	Understand
CO5	Summarize the React applications	Understand

UNIT I BASICS OF FULL STACK 15 HOURS

Understanding the Basic Web Development Framework - User - Browser – Webserver - Backend Services – MVC Architecture - Understanding the different stacks –The role of Express – Angular – Node – Mongo DB – React

UNIT II NODE JS 15 HOURS

Basics of Node JS – Installation – Working with Node packages – Using Node package manager – Creating a simple Node.js application – Using Events – Listeners –Timers - Callbacks – Handling Data I/O – Implementing HTTP services in Node.js

UNIT III MONGO DB 15 HOURS

Understanding NoSQL and MongoDB – Building MongoDB Environment – User accounts – Access control – Administering databases – Managing collections – Connecting to MongoDB from Node.js – simple applications

UNIT IV EXPRESS AND ANGULAR 15 HOURS

Implementing Express in Node.js - Configuring routes - Using Request and Response objects - Angular - Typescript - Angular Components - Expressions - Data binding - Built-in directives

UNIT V REACT **12 HOURS**

MERN STACK – Basic React applications – React Components – React State – Express REST APIs - Modularization and Webpack - Routing with React Router – Server-side rendering

TEXTBOOKS: **TOTAL: 72 HOURS**

1. Dayley, B., Dayley, B., & Dayley, C. (2018). *Node.js, MongoDB and Angular web development* (2nd ed.). Addison-Wesley.
2. Subramanian, V. (2019). *Pro MERN stack: Full stack web app development with Mongo, Express, React, and Node* (2nd ed.). Apress.

REFERENCE BOOKS:

1. Northwood, C. (2018). *The full stack developer: Your essential guide to the everyday skills expected of a modern full stack web developer* (1st ed.). Apress.
2. Chinnathambi, K. (2018). *Learning React: A hands-on guide to building web applications using React and Redux* (2nd ed.). Addison-Wesley Professional.

WEBSITES:

1.https://www.tutorialspoint.com/the_full_stack_web_development/index.asp

2. https://www.coursera.org/specializations/full-stack-react

3.https://www.udemy.com/course/the-full-stack-webdevelopment

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	-	-	2	-	-	-	3	-	-	-	-	-	-	1	-
CO2	3	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	3
CO3	3	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	2	-	-	2	-	-	-	-	-	-	-	-	2
CO5	3	-	-	-	2	-	2	3	-	-	-	-	-	-	-	3	-
Average	3	-	-	-	2.2	-	2	2.5	3	-	-	-	-	-	-	2	2.5

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

SEMESTER VIIIA

24ADU802 SOCIAL NETWORK ANALYSIS 6H - 4C

Instruction Hours / Week: L:6 T:0 P:0 **Marks:** Internal**: 40** External**: 60 T**otal**: 100**

End Semester Exam: 3 Hours

PREREQUISITE:

Not required

COURSE OBJECTIVES (CO)

- To understand the concept of semantic web and related applications.
- To learn knowledge representation using ontology.
- To understand human behaviour in social web and related communities.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Develop semantic web related applications.	Understand
CO2	Represent knowledge using ontology	Apply
CO3	Predict human behaviour in social web and related communities.	Analyze
CO4	Extend and enabling new human experiences	Understand
CO5	Translate visualize social networks.	Understand

UNIT I INTRODUCTION TO SEMANTIC WEB: 15 HOURS

Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities - Web-based networks - Applications of Social Network Analysis.

UNIT II MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION 15 HOURS

Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modelling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data - Advanced representations.

UNIT III EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS 15 HOURS

Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Definition of community - Evaluating communities - Methods for community detection and

UNIT IV PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES 15 HOURS

mining - Applications of community mining algorithms - Tools for detecting communities social network infrastructures and communities - Decentralized online social networks - Multi-Relational characterization of dynamic social network communities.Understanding and predicting human behaviour for social communities - User data management - Inference and Distribution - Enabling new human experiences - Reality mining - Context - Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation - Trust derivation based on trust comparisons - Attack spectrum and countermeasures.

UNIT V VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS 12 HOURS

Graph theory - Centrality - Clustering - Node-Edge Diagrams - Matrix representation - Visualizing online social networks, Visualizing social networks with matrix-based representations - Matrix and Node-Link Diagrams - Hybrid representations - Applications - Cover networks - Community welfare - Collaboration networks - Co-Citation networks.

TOTAL :72 HOURS

TEXT BOOKS:

1. Peter Mika, ―*Social Networks and the Semantic Web*‖, First Edition, Springer 2007.
2. BorkoFurht, ―*Handbook of Social Network Technologies and Applications*‖, 1st Edition, Springer, 2010.

REFERENCE BOOKS:

1. GuandongXu ,Yanchun Zhang and Lin Li, ―*Web Mining and Social Networking – Techniques and applications*‖, First Edition, Springer, 2011.
2. Dion Goh and Schubert Foo, ―*Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively*‖, IGI Global Snippet, 2008.

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	-	-	2	-	-	-	3	-	-	-	-	-	-	1	-
CO2	3	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	3
CO3	3	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	2	-	-	2	-	-	-	-	-	-	-	-	2
CO5	3	-	-	-	2	-	2	3	-	-	-	-	-	-	-	3	-
Average	3	-	-	-	2.2	-	2	2.5	3	-	-	-	-	-	-	2	2.5

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

SEMESTER VIIIA

24ADUA803 ORGANIZATIONAL BEHAVIOR 6H - 4C

Instruction Hours / Week: L:6 T:0 P:0 **Marks:** Internal**: 40** External**: 60 T**otal**: 100**

End Semester Exam: 3 Hours

PREREQUISITE:

Not required

COURSE OBJECTIVES (CO):

- To understand the concepts and processes of perception and attribution and their implications in management and behavior.
- To explore the concepts, principles, and theories of motivation and their application in employee recognition and involvement.
- To comprehend the nature of organizational power and politics, and the role of knowledge management and emotional intelligence.

COURSE OUTCOMES (COS):

COs	Course Outcomes	Blooms Level
CO1	Compare the basic concepts and processes of perception, attitude, and personality in organizational behavior.	Understand
CO2	Identify theories of learning, motivation, and leadership to real-world organizational scenarios.	Apply
CO3	List the sources and implications of power and politics in organizations.	Analyze
CO4	Conclude the processes of organizational change and conflict resolution.	Evaluate
CO5	Modify the impact of stress and organizational culture on employee behavior and performance.	Create

UNIT I INTRODUCTIONTOORGANIZATIONAL BEHAVIOR 15 HOURS

Concept- Nature- Characteristics- Conceptual Foundations and Importance- Models of Organizational Behavior- Management Challenge- A Paradigm Shift- Relationship with Other Fields- Organizational Behavior:Cognitive Framework-Behavioristic Framework andSocial Cognitive Framework

UNIT II PERCEPTIONAND ATTRIBUTION 15 HOURS

Concept-Nature Process Importance. Managemen tand Behavioural Applications of Perception.Attitude:Concept-Processand Importance Attitude Measurement.Attitudes and Work force Diversity.Personality:Concept-Nature Types and Theories of Personality Shaping Personality Attitude and Job Satisfaction.Learning:Concept and Theories ofLearning

UNIT III MOTIVATION 15 HOURS

ConceptsandTheirApplication-Principles-Theories-EmployeeRecognition-Involvement-MotivatingaDiverse Workforce. Leadership: Concept- Function- Style and Theories of

Leadership-Trait- Behaviouraland Situational Theories. Analysis of Interpersonal Relationship-Group Dynamics: Definition- Stages ofGroup Development- Group Cohesiveness- Formal and Informal Groups- Group Processes and DecisionMaking-DysfunctionalGroups

UNIT IV ORGANIZATIONALPOWER ANDPOLITICS 15 HOURS

Concept- Sources of Power- Distinction Between Power- Authority and Influence- Approaches to Power Political Implications of Power:Dys functional Uses of Power.Knowledge Management & Emotional Intelligence in Contemporary Business Organisation.

UNIT V ORGANIZATIONALCHANGE 12 HOURS

Concept- Nature- Resistance to change- Managing resistance to change- Implementing Change-KurtLewinTheory of Change.Conflict:Concept-Sources-Types-Functionality and Dysfunctionality of Conflict-Classification of Conflict Intra-Individual- Interpersonal- Intergroup and Organizational-Resolution of Conflict- Meaning and Types of Grievance and Process of Grievance Handling.Stress:Understanding Stress and Its Consequences-Causes of Stress-Managing Stress.Organizational Culture:Concept-Characteristics-Elements of Culture-Implications of Organisation culture-Process of Organisational Culture.

TOTAL: 72 HOURS

TEXT BOOKS:

1. Newstrom, J. W. (2017). *Organizational behavior: Human behavior at work* (12th ed.). Tata McGraw-Hill.
2. Luthans, F. (2019). *Organizational behavior* (3rd ed.). Tata McGraw-Hill.Top of Form

REFERENCE BOOKS:

1. Judge, T. A., & Robbins, S. P. (2020). *Organizational behavior* (13th ed.). Pearson.
2. Simpson, A., & Clegg, S. (2020). *Positive organizational behavior: A reflective approach* (5th ed.). Taylor & Francis.

WEBSITES:

1.https://www.tutorialspoint.com/the_full_stack_web_development/index.asp
2. https://www.coursera.org/specializations/full-stack-react
3.https://www.udemy.com/course/the-full-stack-webdevelopment

CO, PO, PSO Mapping

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

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

SEMESTER VIIIA

24ADU811A FULL STACK DEVELOPMENT -PRACTICAL 6H - 4C

Instruction Hours / Week: L:0 T:0 P:6 **Marks:** Internal**: 40** External**: 60 T**otal**: 100**

End Semester Exam: 3 Hours

PREREQUISITE

Not required

COURSE OBJECTIVES (CO)

- To understand the various components of full stack development.
- To learn Node.js features and applications
- To develop applications with MongoDB.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Infer the various stacks available for web application development.	Understand
CO2	Assume and Use Node.js for application development	Apply
CO3	Develop applications with MongoDB	Create
CO4	Compare and Use the features of Angular and Express	Understand
CO5	Develop React applications	Create

LIST OF PROGRAMS

1. Develop a portfolio website for yourself which gives details about yourself for a potential recruiter.
2. Create a web application to manage the TO-DO list of users, where users can login and manage their to-do items
3. Create a simple micro blogging application (like twitter) that allows people to post their content which can be viewed by people who follow them.
4. Create a food delivery website where users can order food from a particular restaurant listed in the website.
5. Develop a classifieds web application to buy and sell used products.
6. Develop a leave management system for an organization where users can apply different types of leaves such as casual leave and medical leave. They also can view the available number of days.
7. Develop a simple dashboard for project management where the statuses of various tasks are available. New tasks can be added and the status of existing tasks can be changed among Pending, InProgress or Completed.
8. Develop an online survey application where a collection of questions is available and users are asked to answer any random 5 questions

TOTAL:72HOURS

TERXTBOOKS:

1. Dayley, B., Dayley, B., & Dayley, C. (2018). *Node.js, MongoDB, and Angular web development* (2nd ed.). Addison-Wesley.
2. Subramanian, V. (2019). *Pro MERN stack: Full stack web app development with Mongo, Express, React, and Node* (2nd ed.). Apress.

REFERENCE BOOKS:

1. Dayley, B., Dayley, B., & Dayley, C. (2018). *Node.js, MongoDB, and Angular web development* (2nd ed.). Addison-Wesley.
2. Subramanian, V. (2019). *Pro MERN stack: Full stack web app development with Mongo, Express, React, and Node* (2nd ed.). Apress.

WEBSITES:

1.https://www.tutorialspoint.com/the_full_stack_web_development/index.asp

2. https://www.coursera.org/specializations/full-stack-react

3.https://www.udemy.com/course/the-full-stack-webdevelopment

CO, PO, PSO Mapping

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

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

SEMESTER VIIIA

24ADU812 SOCIAL NETWORK ANALYSIS – PRACTICAL 6H –4C

Instruction Hours / Week: L:0 T:0 P:6 **Marks:** Internal**: 40** External**: 60 T**otal**: 100**

End Semester Exam: 3 Hours

PREREQUISITE:

Not required

COURSE OBJECTIVES (CO)

1. To understand and apply techniques for designing and modeling the aggregation of semantic web data.
2. To learn and implement the representation of ontologies using the Web Ontology Language (OWL).
3. To install and use Gephi software for network visualization and analysis.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Explain and model aggregated data on the semantic web.	Understand
CO2	Develop and represent ontologies using OWL effectively.	Apply
CO3	Install and utilize Gephi software for various network visualization tasks.	Apply
CO4	Invent network graphs and perform comprehensive analysis using them.	Create
CO5	Build and clustering techniques to datasets for insightful data analysis.	Apply

LIST OF EXPERIMENTS

1. Perform Design modelling, aggregating of semantic web
2. Representation of OWL ontology
3. Installation of Gephi software for network visualization and analysis
4. Making of network graphs and conducting analysis on the dataset from Kaggle
5. Perform classification and clustering on the dataset
6. Perform outlier detection analysis with the help of an example

TOTAL:72 HOURS

TEXTBOOKS:

1.Allemang, D., & Hendler, J. (2011). *Semantic web for the working ontologist: Effective modeling with OWL*. Morgan Kaufmann.
2. *OWL 2 web ontology language: Primer*. World Wide Web Consortium (W3C).
3. Chen, L., & Smith, L. P. G. (2015). *Gephi cookbook*. Packt Publishing.

REFERENCE BOOKS:

1. Williams, M. J. (2013). *Network analysis with Gephi cookbook*. Packt Publishing.
2. Bishop, C. M. (2006). *Pattern recognition and machine learning*. Springer
3. Chandola, V., Banerjee, A., & Kumar, V. (2009). Anomaly detection: A survey. *ACM Computing Surveys (CSUR), 41*(3), 1-58. https://doi.org/10.1145/1541880.1541882

WEBSITES:

1. https://nptel.ac.in/courses/108104092
2. https://nptel.ac.in/courses/117106031

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
CO2	3	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO3	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
CO4	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO5	3	2	1	-	-	-	1	-	-	-	-	-	-	-	-	-	1
Average	**2.4**	**1.4**	**0.4**	**-**	**-**	**-**	**0.6**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

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

SEMESTER VIIIB

24ADU801B RESEARCH METHODOLOGY AND IPR 6H - 4C

Instruction Hours / Week: L:6 T:0 P:0 **Marks:** Internal**: 40** External**: 60 T**otal**: 100**

End Semester Exam: 3 Hours

PREREQUISITE

Not Required

COURSE OBJECTIVES (CO):

- 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.

COURSE OUTCOMES (COs):

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

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

UNIT I RESEARCH FORMULATION AND DESIGN 15 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 **15 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 **15 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 **15 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

TEXTBOOKS: **TOTAL: 72 HOURS**

1 Radha Krishnan, R., & Balasubramanian, S. (2012). *Intellectual property rights* (1st ed.). Excel Books.

2 Chintakunta, R. (2022). *A textbook of intellectual property rights*. Blue Hill Publications.

REFERENCEBOOKS:

1. Voldman, S. H. (2018). *From invention to patent: Scientist and engineer's guide*. Wiley.

2. Kothari, C. R., & Garg, G. (2019). *Research methodology: Methods and techniques*. New Age International Publishers.

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

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	3	2	3	1	-	-	-	1	-	-	-	-	-	2	-
CO2	3	-	3	3	1	1	-	-	-	1	-	-	-	-	-	-	-
CO3	3	-	2	2	-	-	-	1	-	1	-	-	-	-	-	2	-
CO4	3	-	-	2	-	2	-	1	-	1	-	-	-	-	-	-	-
CO5	3	-	-	-	2	-	-	1	-	1	-	-	2	-	-	3	-
Average	3	-	2.7	2.3	2	1.3	-	1	-	1	-	-	2	-	-	2.3	-

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

SEMESTER VIIIB

24ADUA811B STATISTICAL ANALYSIS USING R PRACTICAL 6H - 4C

Instruction Hours / Week: L:0 T:0 P:6 **Marks:** Internal**: 40** External**: 60 T**otal**: 100**

End Semester Exam: 3 Hours

PREREQUISITE:

Not Required

COURSE OBJECTIVES (CO):

- To acquire the computing tasks such as using conditional processing statements, loops, and writing one's own functions.
- To perform advanced graphing of data and statistical modeling of data.
- To use statistical distribution functions in R

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Demonstrate how to install and configure software necessary for a statistical programming environment	Understand
CO2	Plan with generic programming language concepts	Apply
CO3	Discover how reading data into R, accessing R packages, writing R functions, debugging, and organizing and commenting R code is done	Analyze
CO4	Identify external data into R for data processing and statistical analysis	Apply
CO5	Design and develop R applications for data analytics	Apply

LIST OF PROGRAMS:

1. Write a program to demonstrate functions and operators
2. **Vectors:** Grouping values into vectors, then doing arithmetic and graphs with them
3. **Matrices:** Creating and graphing two-dimensional data sets
4. **Summary Statistics:** Calculating and plotting some basic statistics: mean, median, and standard deviation
5. **Factors:** Creating and plotting categorized data
6. **Data Frames:** Organizing values into data frames, loading frames from files and merging them
7. Write a program to design R as a calculator
8. Write a program to demonstrate Probability distributions
9. Write a program to demonstrate Importing and exporting data
10. Write a program to Establish a Regression

TOTAL: 72 HOURS

TEXTBOOKS:

1. rolemund, G., & Wickham, H. (2016). *R for data science*. O'Reilly Media.
2. Peng, R. D. (2015). *R programming for data science*. CreateSpace Independent Publishing Platform.
3. Wickham, H. (2014). *Advanced R* (1st ed.). Chapman and Hall/CRC.

REFERENCEBOOKS:

1. Daniel Navarro. (2013). *Learning Statistics with R*. University of Adelaide Publications.
2. JeffreyStanton. (2013). *Introduction to Data Science, with Introduction to R*, Version3 ,

WEBSITES:

1. https://www.r-project.org/
2. https://www.datamentor.io/r-programming/
3. https://www.datacamp.com/courses/free-introduction-to-r?utm_
4. https://www.coursera.org/learn/r-programming
5. https://172.16.25.76/Course/View.php?id = 2216
6. https://nptel.ac.in/courses/111104100/
7. https://nptel.ac.in/content/syllabus_pdf/111104100.pdf
8. https://www.edx.org/learn/r-programming

CO, PO, PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PSO 1	PSO 2
CO1	3	-	-	2	3	2	-	-	1	-	-	-	-	-	-	2	1
CO2	3	-	3	1	-	1	-	-	1	-	-	-	-	-	-	1	-
CO3	3	-	-	2	-	2	-	-	1	-	-	-	-	-	-	-	3
CO4	3	-	2	1	1	1	-	-	1	-	-	-	-	-	-	-	-
CO5	3	-	-	2	-	2	-	-	1	-	-	-	-	-	-	-	2
Average	3	-	2.5	1.6	2	1.6	-	-	1	-	-	-	-	-	-	1.5	2

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

SEMESTER VIIIB

24ADU891	**RESEARCH PROJECT/PREPARATION OF RESEARCH PROJECT**	**18H – 12C**

Instruction Hours / Week: L:18 T:0 P:0 **Marks:** Internal**: 100** External**: 200 T**otal**: 300**

Elective Major -I

Semester V

24ADUE501A NATURAL LANGUAGE PROCESSING 4H - 3C

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

End Semester Exam: 3 Hours

PREREQUISITE:

- **Not Required**

COURSE OBJECTIVES (CO):

- To understand statistical models for language and various techniques for text classification and clustering.
- To study about semantic processing techniques and the workings of information retrieval systems.
- To examine advanced applications such as machine translation, speech processing, and the use of deep learning in NLP.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Explain the basic concepts and techniques of Natural Language Processing	Understand
CO2	Analyze statistical language models and techniques for text analysis	Analyze
CO3	Identify parsing algorithms and understand their application in syntactic analysis.	Apply
CO4	Choose semantic analysis tasks such as Named Entity Recognition, Word Sense Disambiguation, and Semantic Role Labeling	Apply
CO5	Rephrase advanced NLP techniques, including machine translation, speech recognition, and deep learning approaches	Understand

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 II: LANGUAGE MODELING AND TEXT ANALYSIS

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

UNIT III: PARSING AND SYNTACTIC ANALYSIS

Part-of-Speech Tagging-Parsing Algorithms: Dependency and Constituency Parsing

Syntax-Driven Translation-Treebanks and Annotated Corpora

UNIT IV: SEMANTIC ANALYSIS AND INFORMATION RETRIEVAL

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

UNIT V: DEEP LEARNING FOR NLP

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

TEXT BOOKS:

1. Jurafsky, D., & Martin, J.H. (2023). *Speech and Language Processing*, 3rd Edition.
2. Bird, S., Klein, E., & Loper, E. (2009). *Natural Language Processing with Python*, 1st Edition.
3. Goyal, P., Pandey, S., & Jain, K. (2018). *Deep Learning for Natural Language Processing*, 1st Edition.

REFERENCE BOOKS:

1. Manning, C.D., & Schütze, H. (1999). *Foundations of Statistical Natural Language Processing*, 1st Edition.
2. Manning, C.D., Raghavan, P., & Schütze, H. (2008). *Introduction to Information Retrieval*, 1st Edition.

CO, PO, PSO Mapping

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

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

Semester V

24ADUE501B **QUANTUM COMPUTING** **4H - 3C**

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

End Semester Exam: 3 Hours

PREREQUISITE:

- **Not Required**

COURSE OBJECTIVES (CO):

- To learn about various quantum algorithms and understand their applications.
- To explore quantum noise, decoherence, error correction codes, and fault-tolerant quantum computing techniques.
- To understand the principles of quantum cryptography, quantum key distribution, quantum teleportation, and quantum communication protocols.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Explain Quantum Computing Fundamentals	Understand
CO2	Dissect Quantum Algorithms	Analyze
CO3	Illustrate Quantum Error Correction	Understand
CO4	Inspect Quantum Cryptography and Communication	Analyze
CO5	Identify Advanced Quantum Computing Topics	Apply

UNIT I INTRODUCTION TO QUANTUM COMPUTING

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

UNIT II QUANTUM ALGORITHMS

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

UNIT III QUANTUM ERROR CORRECTION

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

UNIT IV QUANTUM CRYPTOGRAPHY AND COMMUNICATION

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

UNIT V ADVANCED TOPICS IN QUANTUM COMPUTING

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

TEXT BOOKS:

1. Nielsen, M.A., & Chuang, I.L. (2010). *Quantum Computation and Quantum Information*, 10th Anniversary Edition.
2. Rieffel, E., & Polak, W. (2011). *Quantum Computing: A Gentle Introduction*, 1st Edition.
3. Kaye, P., Laflamme, R., & Mosca, M. (2006). *An Introduction to Quantum Computing*, 1st Edition.

REFERENCE BOOKS:

1. Yanofsky, N.S., & Mannucci, M.A. (2008). *Quantum Computing for Computer Scientists*, 1st Edition.
2. Hidary, J.D. (2019). *Quantum Computing: An Applied Approach*, 1st Edition.

CO, PO, PSO Mapping

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

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

Semester V

24ADUE501C AUGMENTED REALITY (AR) AND VIRTUAL REALITY (VR) 4H - 3C

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

End Semester Exam: 3 Hours

PREREQUISITE:

- **Not Required**

COURSE OBJECTIVES (CO):

- To introduce students to the basic concepts, history, and technologies of AR and VR.
- To familiarize students with popular development platforms, 3D modeling, scripting, and interaction design for AR and VR applications..
- To impart knowledge on sensor integration, advanced rendering, mixed reality, and real-time data processing for enhanced AR/VR experiences.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Explain Fundamentals of AR and VR	Understand
CO2	Dissect development platforms like Unity and Unreal Engine for AR and VR applications.	Analyze
CO3	Classify human perception in AR/VR environments and its implications for user experience.	Analyze
CO4	Experiment with advanced rendering techniques to improve visual quality in AR and VR.	Apply
CO5	Identify emerging trends and advancements in AR and VR technology.	Understand

UNIT I 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 II 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 III 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 IV ADVANCED AR AND VR TECHNIQUES

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

UNIT V TRENDS AND CHALLENGES

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

TEXT BOOKS:

1. Parisi, T. (2015). *Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web, and Mobile*, 1st Edition.
2. Schmalstieg, D., & Hollerer, T. (2016). *Augmented Reality: Principles and Practice*, 1st Edition.
3. Linowes, J. (2021). *Unity Virtual Reality Projects*, 3rd Edition.

REFERENCE BOOKS:

1. Mullen, T. (2011). *Prototyping Augmented Reality*, 1st Edition.
2. LaValle, S.M. (2016). *Virtual Reality*, 1st Edition.

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	3	1	-	-	1	-	-	-	1	-	-	-	-	-	-	1	-
CO2	3	-	-	-	3	-	-	-	1	-	-	-	-	-	-	-	1
CO3	3	1	2	-	2	-	-	-	1	-	-	-	-	-	-	1	-
CO4	3	-	2	-	3	-	-	-	1	-	-	-	-	-	-	-	-
CO5	3	-	2	-	3	-	-	-	1	-	-	-	-	-	-	-	-
Average	**3**	**1**	**2**	**-**	**2.4**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**

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

Semester V

24ADUE501D MOBILE APPLICATION DEVELOPMENT 4H - 3C

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

End Semester Exam: 3 Hours

PREREQUISITE:

- **Not Required**

COURSE OBJECTIVES (CO):

- To help learners to acquire knowledge on an overview of mobile operating systems, development environments, mobile app lifecycle, and UI/UX design principles
- To Introduce the basics of Java/Kotlin for Android, layouts, views, intents, activities, fragments, and data storage techniques.
- To introduce cross-platform tools like React Native and Flutter, covering building, deploying, code sharing, platform-specific code, and real-world case studies**.**

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Infer the role of development environments in mobile app creation	Understand
CO2	Identify intents, activities, fragments, and various data storage techniques in Android apps.	Apply
CO3	Plan user interfaces using storyboards, XIBs, or programmatically.	Apply
CO4	Select networking and integrate APIs into mobile applications.	Apply
CO5	Rephrase the principles of cross-platform mobile development.	Understand

UNIT I 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 II ANDROID APPLICATION DEVELOPMENT

Basics of Java/Kotlin for Android - Layouts, Views, and Resources - Intents, Activities, and Fragments - Data Storage: SQLite, Shared Preferences

UNIT III iOS APPLICATION DEVELOPMENT

Basics of Swift for iOS - Storyboards, XIBs, and Programmatic UI - View Controllers and Navigation - Data Persistence: Core Data, User Defaults

UNIT IV ADVANCED MOBILE DEVELOPMENT

Networking and API Integration - Location-Based Services - Push Notifications and Background Services - Security and Performance Optimization

UNIT V 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

TEXT BOOKS:

1. Phillips, B., Stewart, C., & Marsicano, K. (2019). *Android Programming: The Big Nerd Ranch Guide*, 4th Edition.
2. Keur, C., & Hillegass, A. (2020). *iOS Programming: The Big Nerd Ranch Guide*, 7th Edition.
3. Miola, A. (2022). *Flutter Complete Reference*, 1st Edition.

REFERENCE BOOKS:

1. Meier, R., & Lake, I. (2018). *Professional Android*, 4th Edition.
2. Eisenman, B. (2017). *Learning React Native*, 2nd Edition.

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	3	2	2	-	-	1	-	-	-	-	-	-	-	-	-	1	-
CO2	3	3	-	-	-	2	2	-	-	-	-	-	-	-	-	-	1
CO3	3	3	3	-	-	2	3	-	-	-	-	-	-	-	-	-	1
CO4	3	1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	1
CO5	3	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Average	**3**	**2**	**2.7**	**-**	**-**	**1.5**	**2.5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1**

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

Semester V

24ADUE501E **GAME DEVELOPMENT** **4H - 3C**

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

End Semester Exam: 3 Hours

PREREQUISITE:

- **Not Required**

COURSE OBJECTIVES (CO):

- To develop game mechanics, dynamics, storytelling, narrative design and animation principles
- To enrich knowledge on 2D and 3D graphics rendering techniques, shaders, visual effects, sound design, integration, and user interface design for games.
- To explore advanced topics such as multiplayer and networked games.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Explain the history, evolution, genres, platforms, and the development of video games.	Understand
CO2	Develop animation in game projects.	Apply
CO3	Compose scripts, handle events, implement physics, collision detection, and artificial intelligence for games.	Apply
CO4	Utilize techniques for 2D and 3D graphics rendering, visual effects, and user interface design in game development.	Apply
CO5	Design and develop multiplayer and networked games.	Create

UNIT I 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 II GAME DESIGN PRINCIPLES

Game Mechanics and Dynamics - Storytelling and Narrative Design - Level Design and World Building - Character Design and Animation

UNIT III PROGRAMMING FOR GAMES

Basics of Game Programming: C#, C++ - Scripting and Event Handling - Physics and Collision Detection - Artificial Intelligence in Games

UNIT IV GRAPHICS AND SOUND

2D and 3D Graphics Rendering - Shaders and Visual Effects - Sound Design and Integration - User Interface Design

UNIT V ADVANCED GAME DEVELOPMENT

Multiplayer and Networked Games - Virtual Reality and Augmented Reality in Games - Performance Optimization - Game Testing and Debugging

TEXT BOOKS:

1. Gregory, J. (2018). *Game Engine Architecture*, 3rd Edition.
2. Bond, J.G. (2017). *Introduction to Game Design, Prototyping, and Development*, 2nd Edition.
3. Nystrom, R. (2014). *Game Programming Patterns*, 1st Edition.

REFERENCE BOOKS:

1. Hocking, J. (2022). *Unity in Action: Multiplatform Game Development in C#*, 3rd Edition.
2. Schell, J. (2019). *The Art of Game Design: A Book of Lenses*, 3rd Edition.

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	2	-	-	-	-	1	-
CO2	3	2	-	-	-	-	2	-	-	-	2	-	-	-	-	-	1
CO3	3	3	1	-	1	-	3	-	-	-	1	-	-	-	-	-	1
CO4	3	3	-	-	1	-	-	-	-	-	3	-	-	-	-	-	-
CO5	3	3	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-
Average	**3**	**2.6**	**1**	**-**	**1**	**-**	**2.5**	**-**	**-**	**-**	**1.8**	**-**	**-**	**-**	**-**	**1**	**1**

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

Elective Minor

B. Sc. CS -Artificial Intelligence & Data Science **2024-2025**

Elective Minor-I

Semester VI

24ADUEA601A	**DIGITAL FORENSICS**	**6H - 3C**

Instruction Hours / Week: L:6 T:0 P:0 **Marks:** Internal**: 40** External**: 60 T**otal**: 100**

End Semester Exam: 3 Hours

PREREQUISITE:

- **Not Required**

COURSE OBJECTIVES (CO):

- To introduce various forensic techniques and tools used in digital forensics.
- To give basic knowledge on logs, event data, and other forensic artifacts.
- To train students to acquire proficiency malware analysis, cloud forensics, IoT forensics, and anti-forensics techniques.

COURSE OUTCOMES (COs):

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

COs	**Course Outcomes**	**Blooms Level**
CO1	Demonstrate awareness of legal and ethical considerations in the field.	Understand
CO2	Select tools and techniques for file system forensics, network forensics, memory forensics, and mobile device forensics.	Apply
CO3	Construct comprehensive forensic reports and presentations based on findings.	Apply
CO4	Experiment with malware analysis to identify and analyze malicious software.	Apply
CO5	Identify future research directions and emerging technologies in the field.	Understand

UNIT I INTRODUCTION TO DIGITAL FORENSICS

Fundamentals of Digital Forensics - Legal and Ethical Considerations - Digital Evidence: Collection and Preservation - Types of Digital Crimes

UNIT II FORENSIC TECHNIQUES AND TOOLS

File System Forensics - Network Forensics - Memory Forensics - Mobile Device Forensics

UNIT III FORENSIC ANALYSIS AND REPORTING

Data Recovery Techniques - Analyzing Logs and Event Data - Report Writing and Presentation - Case Studies and Practical Examples

UNIT IV ADVANCED DIGITAL FORENSICS

Malware Analysis - Cloud Forensics - IoT Forensics - Anti-Forensics Techniques

UNIT V EMERGING TRENDS IN DIGITAL FORENSICS

Artificial Intelligence in Forensics - Blockchain and Cryptocurrency Forensics - Legal Developments and Challenges - Future Research Directions

TEXT BOOKS:

1. Nelson, B., Phillips, A., & Steuart, C. (2018). *Guide to Computer Forensics and Investigations*, 6th Edition.
2. Johansen, G. (2020). *Digital Forensics and Incident Response*, 2nd Edition.
3. Nikkel, B. (2016). *Practical Forensic Imaging*, 1st Edition.

REFERENCE BOOKS:

1. Casey, E. (2011). *Digital Evidence and Computer Crime*, 3rd Edition.
2. Malin, C.H., Casey, E., & Aquilina, J.M. (2008). *Malware Forensics: Investigating and Analyzing Malicious Code*, 1st Edition.

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	3	-	-	-	1	-	-	-	-	1	-	-	-	-	-	1	-
CO2	2	3	-	-	1	-	-	-	-	1	-	-	-	-	-	-	1
CO3	2	-	2	-	2	-	-	-	-	1	-	-	-	-	-	-	1
CO4	2	2	1	-	2	-	-	-	-	1	-	-	-	-	-	-	-
CO5	2	2	1	-	3	-	-	-	-	1	-	-	-	-	-	-	-
Average	**2.2**	**2.3**	**1.3**	**-**	**1.8**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**1**

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

Semester VI

24ADUEA601B PARALLEL AND DISTRIBUTED COMPUTING 6H - 3C

Instruction Hours / Week: L:6 T:0 P:0 **Marks:** Internal**: 40** External**: 60 T**otal**: 100**

End Semester Exam: 3 Hours

PREREQUISITE:

- **Not Required**

COURSE OBJECTIVES (CO):

- To explore different parallel computing architectures.
- To identify distributed computing paradigms such as client-server and peer-to-peer models.
- To learn about fault tolerance, reliability, security in distributed systems, emerging technologies like edge and fog computing

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Understand the Fundamentals of Parallel and Distributed Computing	Understand
CO2	Organize the characteristics and functionalities of multi-core processors,	Analyze
CO3	Analyze different distributed computing models, file systems, databases, and cloud computing technologies	Analyze
CO4	Design, implement, and analyze parallel algorithms for various computing tasks.	Create
CO5	Classify real-world case studies and applications of parallel and distributed computing	Analyze

UNIT I INTRODUCTION TO PARALLEL AND DISTRIBUTED COMPUTING

Overview and History - Parallel Computing Models - Distributed Systems and Architectures - Applications and Use Cases

UNIT II PARALLEL COMPUTING ARCHITECTURES

Multi-core Processors - GPU Computing - Cluster and Grid Computing - Supercomputing

UNIT III DISTRIBUTED COMPUTING PARADIGMS

Client-Server and Peer-to-Peer Models - Distributed File Systems - Distributed Databases - Cloud Computing

UNIT IV PARALLEL AND DISTRIBUTED ALGORITHMS

Design and Analysis of Parallel Algorithms - Message Passing Interface (MPI) - MapReduce and Hadoop - Load Balancing and Scheduling

UNIT V CASE STUDIES

Fault Tolerance and Reliability - Security in Distributed Systems - Emerging Technologies: Edge and Fog Computing - Real-World Case Studies and Applications

TEXT BOOKS:

1. Wilkinson, B., & Allen, M. (2005). *Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers*, 2nd Edition.
2. Tanenbaum, A.S., & Van Steen, M. (2017). *Distributed Systems: Principles and Paradigms*, 3rd Edition.

REFERENCE BOOKS:

1. Grama, A., Gupta, A., Karypis, G., & Kumar, V. (2003). *Introduction to Parallel Computing*, 2nd Edition.
2. Özsu, M.T., & Valduriez, P. (2020). *Principles of Distributed Database Systems*, 4th Edition.
3. Sterling, T., Anderson, M., & Brodowicz, M. (2017). *High Performance Computing: Modern Systems and Practices*, 1st Edition.

CO, PO, PSO Mapping

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PO13**	**PO14**	**PO15**	**PSO1**	**PSO2**
CO1	3	1	-	-	2	-	-	-	-	-	-	-	-	-	-	1	-
CO2	2	1	-	-	2	-	-	-	-	-	1	-	-	-	-	1	-
CO3	2	1	3	-	3	-	-	-	-	-	1	-	-	-	-	-	-
CO4	2	1	-	3	3	-	-	-	-	-	2	-	-	-	-	-	-
CO5	2	1	-	-	3	-	-	-	-	-	1	-	-	-	-	-	-
Average	**2.2**	**1**	**3**	**3**	**2.6**	**-**	**-**	**-**	**-**	**-**	**1.3**	**-**	**-**	**-**	**-**	**1**	**-**

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

Semester VI

24ADUEA601C DEVOPS AND CONTINUOUS INTEGRATION 6H - 3C

Instruction Hours / Week: L:6 T:0 P:0 **Marks:** Internal**: 40** External**: 60 T**otal**: 100**

End Semester Exam: 3 Hours

PREREQUISITE:

- **Not Required**

COURSE OBJECTIVES (CO):

- To enrich knowledge on the benefits of implementing DevOps methodologies
- To gain basic knowledge on containerization technologies such as Docker and Kubernetes
- To excel in scaling and performance optimization techniques in DevOps environments.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Understand DevOps Principles and Practices	Understand
CO2	Examine automated testing and ensure code quality in CI workflows	Analyze
CO3	Make use of Continuous Deployment and Delivery (CD)	Apply
CO4	Apply IaC principles using configuration management and provisioning tools.	Apply
CO5	Select Site Reliability Engineering (SRE) principles for reliable systems.	Apply

UNIT I INTRODUCTION TO DevOps

DevOps Principles and Practices - Benefits of DevOps - Key Concepts: CI/CD, Infrastructure as Code - DevOps Tools and Technologies

UNIT II CONTINUOUS INTEGRATION (CI)

CI Concepts and Workflows - Setting up a CI Pipeline - Version Control Systems: Git, SVN - Automated Testing and Code Quality

UNIT III CONTINUOUS DEPLOYMENT AND DELIVERY (CD)

CD Concepts and Strategies - Deployment Automation Tools: Jenkins, Travis CI - Containerization: Docker and Kubernetes - Monitoring and Logging

UNIT IV INFRASTRUCTURE AS CODE (IaC)

IaC Principles and Tools - Configuration Management: Ansible, Chef, Puppet - Infrastructure Provisioning: Terraform, CloudFormation - Managing Cloud Infrastructure

UNIT V ADVANCED DevOps PRACTICES

DevSecOps: Integrating Security into DevOps - Site Reliability Engineering (SRE) - Scaling and Performance Optimization - Case Studies and Industry Best Practices

TEXT BOOKS:

1. Kim, G., Humble, J., Debois, P., & Willis, J. (2021). *The DevOps Handbook: How to Create World-Class Agility, Reliability, & Security in Technology Organizations*, 2nd Edition.
2. Humble, J., & Farley, D. (2010). *Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation,* 1st Edition.
3. Forsgren, N., Humble, J., & Kim, G. (2018). *Accelerate: The Science of Lean Software and DevOps*, 1st Edition.

REFERENCE BOOKS:

1. Morris, K. (2020). *Infrastructure as Code: Managing Servers in the Cloud*, 2nd Edition.
2. Davis, J., & Daniels, K. (2016). *Effective DevOps: Building a Culture of Collaboration, Affinity, and Tooling at Scale*, 1st Edition.

CO, PO, PSO Mapping

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PO13**	**PO14**	**PO15**	**PSO1**	**PSO2**
CO1	3	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	2
CO3	1	-	2	-	-	-	-	-	-	1	-	-	-	-	-	-	-
CO4	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
CO5	1	1	-	-	2	-	-	-	-	1	-	-	-	-	-	-	-
Average	**1.6**	**1**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**2**

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

Semester VI

24ADUEA601D EMBEDDED SYSTEMS 6H - 3C

Instruction Hours / Week: L:6 T:0 P:0 **Marks:** Internal**: 40** External**: 60 T**otal**: 100**

End Semester Exam: 3 Hours

PREREQUISITE:

- **Not Required**

COURSE OBJECTIVES (CO):

- To discuss Analog-to-Digital Converters (ADCs) and Digital-to-Analog Converters (DACs).
- To introduce development tools and Integrated Development Environments (IDEs) for embedded systems.
- To explore the application of embedded systems in industries such as automotive and aerospace.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Build the basics of embedded systems, including microcontrollers, components, and applications.	Apply
CO2	Compare embedded programming using languages like C and C++	Analyze
CO3	Infer about Interface sensors and actuators with embedded systems.	Understand
CO4	Examine debugging and testing of embedded systems.	Analyze
CO5	Classify the application of embedded systems in industries like automotive and aerospace.	Understand

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS

Basics of Embedded Systems - Microcontrollers vs. Microprocessors - Embedded System Components - Applications of Embedded Systems

UNIT II HARDWARE AND SOFTWARE CO-DESIGN

Embedded Hardware Design - Real-Time Operating Systems (RTOS) - Firmware Development - Embedded Programming Languages: C, C++

UNIT III PERIPHERALS AND INTERFACING

Sensors and Actuators - Communication Protocols: I2C, SPI, UART - ADCs and DACs - Wireless Communication: Bluetooth, Zigbee

UNIT IV EMBEDDED SYSTEM DEVELOPMENT

Development Tools and IDEs - Debugging and Testing Embedded Systems - Power Management in Embedded Systems - Case Studies and Practical Applications

UNIT V EMBEDDED SECURITY

Internet of Things (IoT) - Embedded Security - Embedded Systems in Automotive and Aerospace - Future Trends and Innovations

TEXT BOOKS:

1. Valvano, J. W. (2017). *Embedded Systems: Introduction to the MSP432 Microcontroller*, 1st Edition.
2. Jiménez, M., Palomera, R., & Couvertier, I. (2016). *Introduction to Embedded Systems: Using Microcontrollers and the MSP430*, 2nd Edition.
3. Valvano, J. W. (2017). *Embedded Systems: Real-Time Interfacing to Arm Cortex-M Microcontrollers*, 3rd Edition.

REFERENCE BOOKS:

1. White, E. (2011). *Making Embedded Systems: Design Patterns for Great Software*, 1st Edition.
2. Vahid, F., & Givargis, T. (2001). *Embedded System Design: A Unified Hardware/Software Introduction*, 1st Edition.

CO, PO, PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PO15	PSO1	PSO2
CO1	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
CO2	2	1	-	-	-	-	2	-	-	-	-	-	-	-	-	-	1
CO3	2	1	2	-	-	-	3	-	-	-	-	-	-	-	-	-	2
CO4	2	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	1
CO5	2	1	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
Average	**2.2**	**1**	**2**	**2**	**2**	**-**	**2.5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**1.3**

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

Semester VI

24ADUEA601E BIOINFORMATICS 6H - 3C

Instruction Hours / Week: L:6 T:0 P:0 **Marks:** Internal**: 40** External**: 60 T**otal**: 100**

End Semester Exam: 3 Hours

PREREQUISITE:

- **Not Required**

COURSE OBJECTIVES (CO):

- To enable the learner to know about biological databases and various data types used in bioinformatics.
- To identify data visualization techniques for interpreting bioinformatics data.
- To understand ethical, legal, and social issues related to bioinformatics.

COURSE OUTCOMES (COs):

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

COs	Course Outcomes	Blooms Level
CO1	Understand the fundamentals and significance of bioinformatics	Understand
CO2	Analyze computational algorithms and techniques in bioinformatics	Analyze
CO3	Utilize bioinformatics tools and techniques for sequence and structure analysis	Apply
CO4	Rephrase machine learning techniques to analyze biological data	Understand
CO5	Interpret popular bioinformatics software and tools	Understand

UNIT I INTRODUCTION TO BIOINFORMATICS

Overview of Bioinformatics - Biological Databases and Data Types - Sequence Alignment and Analysis - Genomics and Proteomics

UNIT II COMPUTATIONAL BIOLOGY

Algorithms for Bioinformatics - Phylogenetic Analysis - Structural Bioinformatics - Systems Biology

UNIT III BIOINFORMATICS TOOLS AND TECHNIQUES

Sequence Analysis Tools: BLAST, FASTA - Genome Annotation Tools - Protein Structure Prediction - Data Visualization Techniques

UNIT IV MACHINE LEARNING IN BIOINFORMATICS

Machine Learning Basics - Applications of Machine Learning in Bioinformatics - Predictive Modeling and Data Mining

UNIT V 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

TEXT BOOKS:

1. Mount, D. W. (2004). *Bioinformatics: Sequence and Genome Analysis*, 2nd Edition.
2. Ramsden, J. (2015). *Bioinformatics: An Introduction*, 3rd Edition.
3. Lesk, A. (2019). *Introduction to Bioinformatics*, 5th Edition.

REFERENCE BOOKS:

1. Durbin, R., Eddy, S. R., Krogh, A., & Mitchison, G. (1998). *Biological Sequence Analysis: Probabilistic Models of Proteins and Nucleic Acids*, 1st Edition.
2. Xiong, J. (2006). *Essential Bioinformatics*, 1st Edition.

CO, PO, PSO Mapping

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

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