B.Sc. COMPUTER SCIENCE (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE)

CHOICE BASED CREDIT SYSTEM (CBCS)

Curriculum and Syllabus

Regular (2023 – 2024)

Enable | Enlighten | Enrich

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

DEPARTMENT OF COMPUTER APPLICATIONS

FACULTY OF ARTS, SCIENCE COMMERCE AND MANAGEMENT

KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed to be University)

(Established Under Section 3 of UGC Act,1956)

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

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FACULTY OF ARTS, SCIENCE COMMERCE AND MANAGEMENT

UNDER – GRADUATE PROGRAMMES

(REGULAR PROGRAMME)

REGULATIONS

(2023)

CHOICE BASED CREDIT SYSTEM (CBCS)

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FACULTY OF ARTS, SCIENC, COMMERCE AND MANAGEMENT
UNDERGRADUATE PROGRAMMES
REGULAR MODE
REGULATIONS – 2023

The following regulations are effective from the academic year 2023-2024 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 2023-2024 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.	BBA	Business Administration
9.	B.Sc.	Biotechnology
10.	B.Sc.	Microbiology
11.	B.Sc.	Computer Science
12.	B.Sc.	Information Technology
13.	B.Sc.	Computer Technology
14.	B.Sc.	Computer Science (Cognitive Systems)
15.	B.Sc.	Computer Science (Artificial Intelligence and Data Science)
16.	BCA	Computer Applications

1.2 Mode of Study

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

1.3 Admission Requirements (Eligibility)

A candidate for admission to the first 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)

2. DURATION OF THE PROGRAMMES

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

Programme(s)	Year of Study	Min. No. of Semesters	Max. No. of Semesters
B.Sc., B.Com., BCA and BBA	I	2	4
	II	4	8
	III	6	12
	IV	4	16

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.

3. CHOICE BASED CREDIT SYSTEM

3.1. All programmes are offered under Choice Based Credit System with a total credit from 180 to 182 for UG Programme.

3.2. Credit

Credit means the weightage given to each course by the experts of the Board of Studies concerned. Total credits offered are 160 as per the UGC Guidelines for the UG Programme (Four Years).

4. STRUCTURE OF THE PROGRAMME

4.1 Tamil or any one of the Indian / Foreign Languages *viz,* Malayalam, Hindi, Sanskrit, French is offered as an ability enhancement course for Arts, Science, Commerce and Management Programmes. Four

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, Skill Enhancement Courses, Project Work, Ability Enhancement Courses, Value Added Courses (Common to all UG Programmes), Summer Internship, Research Project/Dissertation 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 a minimum of 80 Credits in Major Courses.

4.2.2. Minor Courses

Students will have the option to choose courses from disciplinary/interdisciplinary minors and skill-based courses. Students have to earn a minimum of 32 Credits in Minor Courses.

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 in the first, second and fourth 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. 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 minimum of 06 credits.

4.2.6. Ability Enhancement Course (AEC)

There are four Ability Enhancement Courses offered during the first four semesters. Four credits are awarded for each course and the examinations will be conducted at the end of each semester. Students have to earn a minimum of 08 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 or second year summer term.

4.2.8. Value Added Courses (VAC)

The students will study three Value Added Courses in the first three semesters of their programme. Two credits are awarded for each course and the examinations will be conducted at the end of each semester. The various Value Added Courses offered are given below:

S.No	Name of the Offering Department	Name of the Course
1.	Biotechnology	Environmental Studies
2.	Commerce	Indian Knowledge System
3.	Biochemistry	Health and Wellness
4.	Computer Science	Cyber Security
5.	Computer Science and Design	Mobile Application Development
6.	Computer Science and Engineering	Internet of Things
7.	Food Technology	Nutrition And Dietetics
		Agricultural Waste And Byproducts Utilization
8.	Electrical and Electronics Engineering	Renewable Energy Resources

4.2.9. Research Project /Dissertation

The candidates shall undertake the project work in the eighth Semester either in the Department/Industry/Research Institute (National / International). The project 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 project work outside the Department, the faculty concerned within the Department shall be the Supervisor and the teacher/scientist under whom the work is carried out will be the Co-supervisor. The candidate shall bring the attendance certificate from the place where the project work 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. Online Course
Students are encouraged to study the online course from SWAYAM/ NPTEL/MOOC in any one of the first seven semesters for which examination shall be conducted at the end of the course by the respective external agencies, if any. The student can register to the courses which are approved by the Department. The student shall produce a Pass Certificate from the respective agencies. The credit(s) earned by the students will be transferred to the concerned course in the mark statement.

6. Extra Curricular Activities
Every student is encouraged to participate in at least any one of the following activities:

- NSS
- NCC
- Sports / Mass drill
- YRC
- Club activities
- Other Co-curricular and 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 on the following parameters.

- 75% weightage for active participation in Extra Curricular Activities in / out of the KAHE.

- 25% weightage for Exemplary Awards/Honours/Prizes secured.

6.1 Marks for Co-curricular and 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.

7. 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.

8. MAXIMUM MARKS

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).

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

9. a. 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 12 of this regulation.

b. ONLINE COURSE COORDINATOR

To help students in planning their online courses and for general advice on online courses, the HoD shall nominate a coordinator for the online courses. The Online course coordinator shall identify the courses 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 advice the students regarding the online courses and monitor their participation.

10. 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 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.

11. 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.

12. REQUIREMENTS TO APPEAR FOR THE END SEMESTER EXAMINATION

a. Ideally, 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 attend at least 75% of the classes and the conduct of the candidate has been satisfactory during the course.

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

c. However, a candidate who has secured attendance less than 65% in the current semester due to any reason shall not be permitted to appear for the current semester examinations. But he/she will be permitted to appear for his/her supplementary examinations, if any and he/she has to re-do the same semester with the approval of the Dean, Students Affairs and Registrar.

13. PROCEDURE FOR AWARDING MARKS FOR INTERNAL ASSESSMENT

13.1 **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 class, the test marks and the record of class work (topic covered), separately for each course. This should be submitted to the HoD once in a week for checking the syllabus coverage, records of test marks and attendance. The HoD shall sign with date after due verification. The same shall be submitted to respective Dean once in a fortnight. After the

completion of the semester the HoD should keep this record in safe custody for five years as records of attendance and assessment shall be submitted for inspection as and when required by the KAHE/any other approved body.

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

Theory Courses

S. No.	Category	Maximum Marks
1.	Assignment	5
2.	Attendance	5
3	Seminar	5
4.	Test – I (1 ½ units- Unit I and II)	8
5	Test – II (1 ½ units Unit II and III)	8
6	Test III (2 units Unit IV and V)	9
Continuous Internal Assessment: Total		40

Practical Courses

S. No.	Category	Maximum Marks
1.	Attendance	5
2.	Observation work	5
3.	Record work	5
4.	Model Examination	20
5.	*Viva – voce* [Comprehensive]*	5
Continuous Internal Assessment: Total		**40**

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

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

13.3 Portions for Test Question Paper

Portions for Internal Test – I   : First 1 ½ Units (Unit I and II)
Portions for Internal Test – II   : Second 1 ½ Units (Unit II and III)
Portions for Internal Test – III   : Two units (Unit IV and V)

13.4 Pattern of Test Question Paper

Instruction	Remarks
Maximum Marks	50 marks
Duration	2 Hours
Part – A	Objective type (20 x1=20)
Part - B	Short Answer Type (3 x2 = 6)
Part - C	3 Eight mark questions 'either – or' choice (3 x 8 = 24 Marks)

13.5 Attendance

Marks Distribution 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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14. ESE EXAMINATIONS

14.1 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 60 marks.

Pattern of ESE Question Paper:

Instruction	Remarks
Maximum Marks	60 marks for ESE.
Duration	3 hours (½ Hr for Part – A Online & 2 ½ Hours for Part – B and C)
Part - A	20 Questions of 1 mark each (20 * 1 = 20 Marks) Question No. 1 to 20 Online Multiple Choice Questions
Part- B	5 Questions of 2 marks each (5 * 2 = 10 Marks) Covering all the five units of the syllabus Question No. 21 to 25
Part- C	5 six marks Questions of 6 marks each (5 * 6 = 30 Marks.) Question No. 26 to 30 will be 'either-or' type, covering all five units of the syllabus; i.e., (Question No. 26: Unit - I, either 26 (a) or 26 (b), Question No. 27: Unit - II, either 27 (a) or 27 (b), Question No. 28: Unit - III, either 28 (a) or 28 (b), Question No. 29: Unit - IV, either 29 (a) or 29 (b), Question No. 30: Unit - V, either 30 (a) or 30 (b))

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

Experiments	: 40 Marks
Record	: 10 Marks
Viva-voce	: 10 Marks
Total	**: 60 Marks**

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

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

14.3. **Evaluation of Project Work**

14.3.1 The project work shall carry a maximum of 100 marks. (CIA - 40 and ESE – 60*)

*Combined valuation of Internal and External Examiners.

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

14.3.3 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.

14.3.4 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. For this purpose, the same Internal and External examiner shall evaluate the resubmitted report in the subsequent semester.

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

15. PASSING REQUIREMENTS

15.1 Passing minimum: There is a passing minimum, 20 marks out of 40 marks for CIA and the passing minimum is 30 marks out of 60 marks in ESE. The overall passing in each course is 50 out of 100 marks (Sum of the marks in CIA and ESE examination).

15.2 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).

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

15.4 CIA marks (if it is pass) obtained by the candidate in the first appearance shall be retained by the Office of the Controller of

Examinations and considered valid for all subsequent attempts till the candidate secures a pass in ESE.

15.5 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.

16. IMPROVEMENT OF MARKS IN THE COURSES ALREADY PASSED

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

17. 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

18. GRADE SHEET
After the declaration of the results, Grade Sheets will be issued to each student which will contain the following details:
i.   The list of courses enrolled during the semester and the grade scored.
ii.   The Grade Point Average (**GPA**) for the semester and

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

     iv.   Remark on Extension Activities (only in the 6th Semester Grade Sheet)

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

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

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

$$\text{CGPA of the entire programme} = \frac{\text{Sum of the product of the GPs by the corresponding credits of the courses offered for the entire programme}}{\text{Sum of the credits of the courses of the entire programme}}$$

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

where,

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

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

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

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

19. 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. For the same, the prescribed application has to be sent to the Controller of Examinations through the HoD. **A candidate can apply for revaluation of answer scripts not exceeding 5 courses at a time.** The Controller of

Examinations will arrange for the revaluation and the results will be intimated to the candidate through the HoD concerned. Revaluation is not permitted for supplementary theory courses.

20. TRANSPARENCY AND GRIEVANCE COMMITTEE

Revaluation and Retotaling are allowed on representation (clause 19). Student may get the Xerox copy of the answer script on payment of prescribed fee, if he / she wishes. The student may represent the grievance, if any, to the Grievance Committee, which consists of Dean of the Faculty, (if Dean is HoD, the Dean of another Faculty nominated by the KAHE), the HoD of Department concerned, the faculty of the course and Dean from other discipline nominated by the KAHE and the CoE. If the Committee feels that the grievance is genuine, the script may be sent for external valuation; the marks awarded by the External examiner will be final. The student has to pay the prescribed fee for the same.

21. ELIGIBILITY FOR THE AWARD OF THE DEGREE

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

- Successfully completed all the components 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 class 2.1.
- Not any disciplinary action pending against him / her.
- The award of the degree must be approved by the Board of Management.

22. CLASSIFICATION OF THE DEGREE AWARDED

22.1 Candidate who qualifies for the award of the Degree (vide clause 21) having passed the examination in all the courses in his / her first appearance, within the specified minimum number of semesters and securing a **CGPA not less than 8** shall be declared to have passed the examination in the **First Class with Distinction.**

22.2 Candidate who qualifies for the award of the Degree (vide clause 21) 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**.

22.3 All other candidates (not covered in clauses 22.1 and 22.2) who qualify for the award of the degree (vide Clause 21) shall be declared to have passed the examination in the **Second Class**.

23.PROVISION FOR WITHDRAWAL FROM END-SEMESTER EXAMINATION

23.1 Based on valid reasons and on prior application the Candidate may be granted permission to withdraw from appearing for the examination of any one course or consecutive examinations of more than one course in a semester examination.

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

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

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

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

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

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

24. PROVISION FOR AUTHORISED BREAK OF STUDY

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

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

24.3 The authorized break of study (for a maximum of one year) will not be counted for the duration specified for passing all the courses for the purpose of classification. (vide clause 22). However, additional break of study granted will be counted for the purpose of classification.

24.4 The total period for completion of the Programme reckoned from, the commencement of the first semester to which the candidate was admitted shall not exceed the maximum period specified in clause 2.1 irrespective of the period of break of study (vide clause 24.1) in order that he/she may be eligible for the award of the degree.

24.5 If any student is detained for want of requisite attendance, progress and good conduct, the period spent in that semester shall not be considered as permitted 'Break of Study' or 'Withdrawal' (Clause 23 and 24) is not applicable for this case.

25. RANKING

A candidate who qualifies 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.

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.

29. 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 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.

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: The program must enable students to attain by the time of graduation

a) An ability to apply knowledge of computing and mathematics appropriate to the program's student outcomes and to the discipline

b) An ability to analyze a problem, identify and define the computing requirements appropriate to its solution

c) An ability to design, implement and evaluate a computer-based system, process, component or program to meet desired needs.

d) An ability to function effectively on teams to accomplish a common goal

e) An understanding of professional, ethical, legal, security and social issues and responsibilities

f) An ability to communicate effectively with a range of audiences

g) An ability to use current techniques, skills and tools necessary for computing practice

h) An ability to use and apply current technical concepts and practices in the core information technologies of human computer interaction, information management, programming, networking, web systems and technologies

i) An ability to effectively integrate IT-based solutions into the user environment

j) An understanding of best practices and standards and their application

PROGRAM SPECIFIC OUTCOME (PSOs)

k) Understand analyze and develop computer programs in the areas related to Database systems and big data Analytics, cloud computing, soft computing, web designing, mobile computing and networking for efficient design of computer-based system of varying complexity.

l) Implement Artificial Intelligence and data science techniques such as search algorithms, neural networks, machine learning and data analytics for solving a problem and designing novel algorithms for successful career and entrepreneurship.

m) Understand, analyze and develop essential proficiency in the areas related to data science and artificial intelligence in terms of underlying statistical and computational principles and apply the knowledge to solve practical problems.

n) An ability to produce cost effective, quality and maintainable software products and solutions (services) meeting the global standards and requirements with the knowledge acquired and using the emerging techniques, tools and software engineering methodologies and principles and able to comprehend and write effective project reports in multidisciplinary environment in the context of changing technologies.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO I: To be a working Information Technology (IT) professional with core competencies that can be used on multi-disciplinary projects

PEO II: To provide the knowledge in artificial intelligence techniques and apply them to develop relevant models and real time products.

PEO III: To provide knowledge in data science for modern computational data analysis and modeling methodologies.

PEO IV: To understand, evaluate and practice ethical behavior within the IT industry

PEO V: To be cognizant of security issues and their impacts on industry

MAPPING of PEOs and POs

POs	a	b	c	d	e	f	g	h	i	j	k	l	m	n
PEO I	X	X	X				X	X	X		X			X
PEO II			X					X				X	X	X
PEO III			X				X	X		X		X	X	X
PEO IV			X	X	X	X			X		X			
PEO V					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)
(2023–2024 Batch and onwards)

Course code	Name of the course	Objectives and out comes PEOs	POs	L	T	P	Credit(s)	CIA 40	ESE 60	Total 100	Category	Page No
SEMESTER – I												
23LSU101	Language – I	IV	d,e	4	-	-	4	40	60	100	AEC	1
23ENU101	English – I	IV	d,e	3	-	-	3	40	60	100	MDC 1	6
23ADU101	Programming in C	I	a,b,c	5	**-**	**-**	5	40	60	100	Major 1	8
23ADU102	Numerical Methods	III	h,,j	4	**-**		4	40	60	100	Min 1	10
23ADU111	Programming in C - Practical	I	a,b,c	-	**-**	4	2	40	60	100	Major 2	12
23SEC101	Office Automation – Practical	III	a,g	-	**-**	6	3	40	60	100	SEC 1	14
23VAC101	Environmental Studies	IV	d,e	2	-	-	2	40	60	100	VAC 1	16
	Activity/Library/Seminar			2	-	-	-					18
Semester Total				**20**	**-**	**10**	**23**	**280**	**420**	**700**		
SEMESTER – II												
23LSU201	Language – II	IV	d,e,f	4	-	-	4	40	60	100	AEC	19
23ENU201	English - II	IV	d,e	3	-	-	3	40	60	100	MDC 2	23
23ADU201	Object Oriented Programming	II	d,e,f	5	-	-	5	40	60	100	Major 3	25
23ADU202	Discrete Structures	IV	h,,j	4	-	-	4	40	60	100	Min 2	27
23ADU211	Object Oriented Programming - Practical	I	a,b,c	-	-	4	2	40	60	100	Major 4	29
23SEC201	Web Programming- Practical	I	a,c,g	-	-	6	3	40	60	100	SEC 2	31
23VAC201	Indian Knowledge System	IV	d,e	2	-	-	2	40	60	100	VAC 2	34
	Activity/Library/Seminar			2	-	-	-	-	-	-	-	36
Semester Total				**20**	**-**	**10**	**23**	**280**	**420**	**700**		

	SEMESTER – III											
23LSU301	Language – III	IV	d,e,f	4	-	-	4	40	60	100	AEC	37
23ENU301	English - III	IV	d,e	3	-	-	3	40	60	100	MDC 2	40
23ADU301	Operating Systems	I	a,b,h	5	-	-	5	40	60	100	Major 5	42
23ADU302	Data Structures	I	a,b,h	4	-	-	4	40	60	100	Major 6	44
23ADU303	Operations Research	III	h,,j	4	-		4	40	60	100	Min 3	46
23ADU311	Operating Systems - Practical	I	a,b,h	-	-	3	1	40	60	100	Major 7	48
23ADU312	Data Structure using Python - Practical	III	a,b,h,k	-	-	3	1	40	60	100	Major 8	50
23VAC301	Health and Wellness	IV	d,e	2	-	-	2	40	60	100	VAC 3	52
23ADU391	Internship*						2		-	100		54
	Activity/Library/Seminar			2	-	-	-	-	-	-	-	55
Semester Total				**24**	**-**	**6**	**26**	**320**	**480**	**900**		
	SEMESTER – IV											
23LSU401	Language – IV	IV	d,e,f	4	-	-	4	40	60	100	AEC	56
23ENU401	Communicative English	IV	d,e	3	-	-	3	40	60	100	SEC3	58
23ADU401	Fundamentals of Data Science	V	b,c,g	4	-	-	3	40	60	100	Major 9	60
23ADU402	Relational Database Management Systems	II	b,c,g	4	-	-	3	40	60	100	Major 10	62
23ADU403	Cyber Security	III	a,b,h,j,k	3			3	40	60	100	Major 11	64
23ADU404	Probability and Statistics	I	h,,j	4	-	-	4	40	60	100	Min 4	67
23ADU411	Fundamentals of Data Science – Practical	V	b,c,g	-	-	3	1	40	60	100	Major 12	70
23ADU412	Relational Database Management Systems -Practical	II	a,b,h,j,k			**3**	1	40	60	100	Major 13	72
	Activity/Library/Seminar			2	-	-	-	-	-	-	-	77
Semester Total				**24**	**-**	**6**	**22**	**320**	**480**	**800**		

Code	Course												
23ADU501	Fundamentals of Artificial Intelligence	III	a,b,h,j	6	-	-	5	40	60	100	Maj or 14	78
23ADU502A	Data Visualization	I	b,c,g	6	-	-	5	40	60	100	Maj or 15	80
23ADU502B	Cloud Computing	I	a,b,g,k									82
23ADU503A	Data Communication and Networks	II	b,c,g	4	-	-	4	40	60	100	Maj or 16	84
23ADU503B	Mobile Computing	II	b,c,g									86
23ADU504	Basics of Accounting	II	a,b,c,d	6	-	-	5	40	60	100	Min 5	88
23ADU511	Fundamentals of Artificial Intelligence -Practical	III	a,b,h,j	-	-	5	2	40	60	100	Maj or 17	90
23ADU512A	Data Visualization– Practical	III	b,h,j,k	-	-	3	1	40	60	100	Maj or 18	92
23ADU512B	Cloud Computing- Practical	I	a,b,g,k	-	-							94
23ADU591	Internship*						2			100		96
	Semester Total			**22**	**08**	**24**	**240**	**360**	**700**			

Code	Course												
23ADU601	Software Engineering	V	e,j,l	6	-	-	5	40	60	100	Maj or 19	97
23ADU602A	Machine Learning	I	a,d,g,	6	-	-	5	40	60	100	Maj or 20	99
23ADU602B	Big Data Analytics	I	a,b,c									101
23ADU603	Entrepreneurship	I	a,d,g,	6	-	-	5	40	60	100	Min 6	103
23ADU612A 23ADU612B	Machine Learning-Practical / Big Data Analytics-Practical	II	b,c,g, a,	-	-	4	2	40	60	100	Maj or 21	105 / 107
23ADU691	Project	III	a,b,c,g	-	-	8	5	40	60	100	Maj or 22	109
ECA / NCC / NSS / Sports / General interest etc						Good						
	Semester Total			**18**	**-**	**12**	**22**	**200**	**300**	**500**		
	Grand Total			**128**	**-**	**52**	**140**	**1640**	**2460**	**4300**		

Code	Course			L	T	P	C	CIA	ESE	Total		Page
23ADU701	Deep Learning	I	b,c,g	6	-	-	4	40	60	100	Maj or 23	110
23ADU702	Natural Language Processing	I	b,c,g	6	-	-	4	40	60	100	Maj or 24	112
23ADU703	Statistical Computing	III	h,j	6	-	-	4	40	60	100	Min 7	114
23ADU711	Deep Learning – Practical	I	b,c,g	-	-	6	4	40	60	100	Maj or 25	116
23ADU712	Natural Language Processing – Practical	I	b,c,g	-	-	6	4	40	60	100	Maj or 26	118
	Semester Total			**18**	**-**	**12**	**20**	**200**	**300**	**500**		
	SEMESTER -VIII A											
23ADU801	Fullstack Development	I	c,h,i	6	-	-	4	40	60	100	Maj or 27	119
23ADU802	Social Network Analysis	II	b,c,g, a,	6	-	-	4	40	60	100	Maj or 28	121
23ADU803	Organizational Behavior	I	b,c,g	6	-	-	4	40	60	100	Min 8	123
23ADU811	Fullstack Development -Practical	I	c,h,i		-	6	4	40	60	100	Maj or 29	125
23ADU812	Social Network Analysis – Practical	II	b,c,g, a,	-	-	6	4	40	60	100	Maj or 30	127
	Semester Total			**18**	**-**	**12**	**20**	**200**	**300**	**500**		
	SEMESTER -VIII -B											
23ADU801	Research Methodology and IPR	I	b,c,g	6	-	-	4	40	60	100	Maj or 31	130
23ADU811	Statistical Analysis using R Practical	I	a,c,h,i	6	-	-	4	40	60	100	Min or 8	132
23ADU891	Research Project/Preparation of Research Project	I	b,c,g		-	18	12	100	200	300	Maj or 32	134
	Semester Total			**12**	**-**	**18**	**20**	**180**	**320**	**500**		
	Grand Total			**176**	**-**	**94**	**180**	**2220**	**3380**	**5800**		

Ability Enhancement Courses (AEC)		
Semester	**Course Code**	**Name of the Course**
I	23LSU101	Language –I
II	23LSU201	Language –II
III	23LSU301	Language –III
IV	23LSU401	Language –IV

Multi-Disciplinary Course (MDC)		
Semester	**Course Code**	**Name of the Course**
I	23ENU101	English – I
II	23ENU201	English – II
III	23ENU301	English – III

Major Courses		
Semester	**Course Code**	**Name of the Course**
I	23ADU101	Programming in C
	23ADU111	Programming in C-Practical
II	23ADU201	Object Oriented Programming
	23ADU211	Object Oriented Programming – Practical
III	23ADU301	Operating Systems
	23ADU302	Data Structures
	23ADU311	Operating Systems-Practical
	23ADU312	Data Structures using python -Practical
IV	23ADU401	Fundamentals of Data science
	23ADU402	Relational Database Management System
	23ADU403	Cyber Security
	23ADU411	Fundamentals of Data Science-Practical
	23ADU412	Relational Database Management System-Practical
V	23ADU501	Fundamentals of Artificial Intelligence
	23ADU502A	Data Visualization
	23ADU502B	Cloud Computing

	23ADU503A	Data Communication Networks
	23ADU503B	Mobile Computing
	23ADU511	Fundamentals of Artificial Intelligence-Practical
	23ADU512A	Data Visualization -Practical
	23ADU512B	Cloud Computing -Practical
VI	23ADU601	Software Engineering
	23ADU602A	Machine Learning
	23ADU602B	Big Data Analytics
	23ADU612A	Machine Learning-Practical
	23ADU612B	Big Data Analytics-Practical
	23ADU691	Project
VII	23ADU701	Deep Learning
	23ADU702	Natural Language Processing
	23ADU711	Deep Learning-Practical
	23ADU712	Natural Language Processing -Practical
VIII A	23ADU801	FullStack Development
	23ADU802	Social Network Analysis
	23ADU811	FullStack Development-Practical
	23ADU812	Social Network Analysis-Practical
VIII B	23ADU801	Research Methodology and IPR
	23ADU891	Research Project/Preparation of Research Project

Minor		
Semester	**Course Code**	**Name of the Course**
I	23ADU102	Numerical Methods
II	23ADU202	Discrete Structures
III	23ADU303	Operation Research
IV	23ADU404	Probability and statistics
V	23ADU504	Basics of Accounting
VI	23ADU603	Entrepreneurship
VII	23ADU703	Statistical Computing

VIII-A	23ADU803	Organizational Behavior
VIII-B	23ADU811	Statistical Analysis using R- Practical

Skill Enhancement Courses (SEC)		
Semester	**Course Code**	**Name of the Course**
I	23SEC101	Office Automation-Practical
II	23SEC201	Web Programming -Practical
IV	23ENU401	Communicative English

Value Added Course(VAC)		
Semester	**Course Code**	**Name of the Course**
I	23VAC101	Environmental Studies
II	23VAC201	Indian Knowledge System
III	23VAC301	Health and Wellness

Course Distribution Table:

Category	No. of Courses		Total
	Theory	**Practical**	
Major	18	14	32
Minor	8	1	9
AEC	4	0	4
MDC	3	0	3
SEC	1	2	3
VAC	3	0	3
	37	16	54

Course Distribution

- Major — 32
- Minor — 9
- AEC — 4
- MDC — 3
- SEC — 3
- VAC — 3

SEMESTER-I
LANGUAGE -I

4H -3C

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

பாடத்திட்டப் பொதுநோக்கம்

- கற்றல் வழி சிந்தனைத் திறனையும், கருத்து வெளிப்பாட்டுத் திறனையும், மேம்படுத்துதல்.

- ஆய்வுநோக்கை மேம்படுத்துதல்.

- இலக்கியங்கள் உணர்த்தும் வாழ்வின் நுட்பமான பகுதிகளை உணர்த்துதல்.

- மனித மனத்தினைப் பக்குவப்படுத்துதலில் இலக்கியம் தரும் பங்கினை உணர்த்துதல்.

- வளர்ந்து வரும் சமூகத்தில் அறஉணர்வு, பண்பாடு போன்றவை குறித்து அறிவூட்டல். அரசுத் தேர்வுகளுக்கு மாணவர்களை ஆயத்தமாக்குதல்.

பாடத்திட்டப் பயன்விளைவு

- இந்தியக் குடியுரிமைப்பணி முதலான போட்டித் தேர்வுகளில், விருப்பப்பாடமாக இடம் பெறுகின்ற, 'தமிழ் இலக்கிய வரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.

- கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வு மனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.

- தமிழின் வளர்ச்சித்துறையாகிய, 'அறிவியல் தமிழ்' ; 'இணையதமிழ்' குறித்த பன்நோக்கு அணுகு முறையிலான ஆய்வுச்சிந்தனை மேம்பாடு.

- வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல்.

- சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி, மொழிபெயப்புத் துறை சார்ந்த வேலைவாய்ப்புத்திறன் பெற்றிருத்தல்

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

இலக்கிய இன்பம்

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- வையத்துள் வாழ்வாங்கு

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' - ' கொணர்காஈங்குஎன (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' - 'மருங்குளன்' (66-72)

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

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

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

சொல்இலக்கணம்- பெயர், வினை, இடை, உரிச்சொல்-விளக்கமும் பயிற்சியும்

அலகு– 3   (10 மணிநேரம்)

அறஇலக்கியங்கள் அறிமுகம்

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

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

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

காப்பியம் - சூளாமணி–அரசியல்சருக்கம்- 1. 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 – மண்ணோடும் 6038- வாங்கிய 6170 – இங்குள 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 வங்கி மேலாளருக்கு விண்ணப்பம்

6. வசிப்பிடத்திற்கு அடிப்படை வசதிவேண்டி வட்டாட்சியருக்கு விண்ணப்பம்

7. விருதுபெற்ற நண்பனுக்குப் பாராட்டுக் கடிதம்

8. புத்தகங்கள் அனுப்பி உதவவேண்டி, பதிப்பகத்தாருக்கு விண்ணப்பம்

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

SEMESTER-I
ENGLISH I

3H-3C

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

End Semester Exam:3Hours

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

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

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

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I   **7 HOURS**
LISTENING: Listening –Types of Listening
SPEAKING: Face to Face Conversation
READING: Reading – Types of Reading
WRITING: Jumbled Sentences
LITERATURE: Ode on a Grecian Urn by John Keats
GRAMMAR: Parts of Speech

UNIT II   **7 HOURS**
LISTENING: Principles of Listening Skills
SPEAKING: Descriptions

READING: Reading Techniques
WRITING: Paragraph Writing
LITERATURE: Of Friendship by Francis Bacon
GRAMMAR: Articles

UNIT III   **7 HOURS**
LISTENING: Barriers of Listening
SPEAKING: Telephone Conversations
READING: Reading Comprehension Passages
WRITING: Precise Writing
LITERATURE: The Umbrella man by Roald Dahl
GRAMMAR: Tense

UNIT IV   **7 HOURS**
LISTENING: Story Narrations
SPEAKING: Group Discussion
READING: Reading Reports and Profiles
WRITING: Letter Writing
LITERATURE: Tyger by William Blake
GRAMMAR: Subject and Predicate – Question Tags

UNIT V   **8 HOURS**
LISTENING: Listening Strategies
SPEAKING: Interview Skills
READING: Tips for MOC- Anchoring
WRITING: Circular Writing and Summary Writing
LITERATURE: Short story: Rapunzel by the Brothers Grimm
GRAMMAR: Framing Questions

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

SEMESTER-I
PROGRAMMING IN C

5H -5C

Instruction Hours / Week: 5 T: 0 P: 0   Marks: Internal:**40**   External:**60**   Total: **100**
                                              End Semester Exam: 3 Hours

Course Objectives
- To impart knowledge about C programming.
- To understand the concepts and techniques in C Programming.
- To equip and indulge themselves in problem solving using C.
- To understand the working of Decision Making and Control Structures.
- To impart the basic knowledge of Function Structure and Union.
- Know the fundamentals of Pointer and File Management Pointer.

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

COs	Course Outcomes	Blooms Level
CO1	Learn about the Computer fundamentals and the Problem solving	Understand
CO2	Understand the basic concepts of C programming	Understand
CO3	Describe the reason why different decision making and loop constructs are available for iteration in C	Apply
CO4	Demonstrate the concept of User defined functions, Recursions Scope and Lifetime of Variables, Structures and Unions	Analysis
CO5	Demonstrate the concept of User defined functions, Recursions, Scope and Lifetime of Variables, Structures and Unions	Create

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I Overview of C   **13 HOURS**
Overview of C - Introduction - Character set - C tokens - keyword & Identifiers - Constants - Variables - Data types - Declaration of variables - Assigning values to variables - Defining Symbolic Constants - Arithmetic, Relational, Logical, Assignment, Conditional, Bitwise, Special, Increment and Decrement operators - Arithmetic Expressions - Evaluation of expression - precedence of arithmetic operators - Type conversion in expression – operator precedence & associativity - Mathematical functions - Reading & Writing a character - Formatted input and output.

UNIT II Decision Making and Looping   12 HOURS

Decision Making and Branching: 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 Introduction to Array and String   13 HOURS

One-dimensional Arrays, Declaration of One-dimensional Arrays, Initialization of One-dimensional Arrays, Example programs- Bubble sort, Selection sort, Linear search, Binary search, Two-dimensional Arrays, Declaration of Two-dimensional Arrays, Initialization of Two-dimensional Arrays, Example programs-Matrix Multiplication, Transpose of a matrix. Character Arrays and Strings: Declaring and Initializing String Variables, Reading Strings from Terminal, Writing Strings to Screen, Arithmetic Operations on Characters, String-handling Functions, Example Programs (with and without using built-in string functions)

UNIT IV User-Defined Functions, Structures and Unions   12 HOURS

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- Multi file Programs. Structures and Unions

UNIT V Pointers & File Management Pointers   10 HOURS

Introduction-Understanding pointers -Accessing the address of a variable Declaration and Initialization of pointer Variable – Accessing a variable through its pointer Chain of pointers Pointer Expressions – Pointer Increments and Scale factor- Pointers and Arrays- Pointers and Strings – Array of pointers – Pointers as Function Arguments Functions returning pointers – Pointers to Functions – Pointers and Structures. File Management in C.

Suggested Readings

1   E. Balaguruswamy, "Programming in ANSI C", 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.
2   Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.
3   Kernighan B.W and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, 2015, Pearson Education India, ISBN: 978-93-3254-944-9.
4   Yashavant P. Kanetkar, "Let Us C", 16th Edition, 2019, BPB Publications, ISBN: 978-93- 8728-449-4
5   Jacqueline A Jones and Keith Harrow, "Problem Solving with C", Pearson Education. ISBN: 978-93-325-3800-9

Websites

1   http://elearning.vtu.ac.in/econtent/courses/video/BS/14CPL16.html
2   https://nptel.ac.in/courses/106/105/106105171

SEMESTER-I
NUMERICAL METHODS

4H -3C

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

End Semester Exam: 3 Hours

Course Objectives

- To understand the basic concepts of numerical methods and to develop mathematical skills in the areas of numerical methods
- To understand numerical techniques as powerful tool in scientific computing.
- To provide suitable and effective methods called Numerical Methods, for obtaining approximate representative numerical results of the problems.
- To solve problems in the field of Applied Mathematics, Theoretical Physics and Engineering which requires computing of numerical results using certain raw data.
- To solve complex mathematical problems using only simple arithmetic operations. The approach involves formulation of mathematical models of physical situations that can be solved with arithmetic operations

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Apply Numerical analysis which has enormous application in the field of science	Apply
CO2	Familiar with numerical integration and differentiation, numerical solution of ordinary differential equations.	Understand
CO3	Familiar with calculation and interpretation of errors in numerical method.	Understand
CO4	Develop and apply the appropriate numerical techniques for the problem, interpret the results, and assess accuracy.	Apply
CO5	Understand the concept of difference operators, the use of Interpolation, Numerical Differentiation & Integration and numerical solutions of ordinary differential equations and use of Interpolation	Apply

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I   **10 HOURS**

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

UNIT II   **10 HOURS**

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

UNIT III   **10 HOURS**

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

UNIT IV   **9 HOURS**

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

UNIT V   **9 HOURS**

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

Suggested Readings

1   P. Kandasamy, Dr. K. Thilagavathy, Dr. K. Gunavathi (2013), Numerical Methods, Published By S.Chand& Company Pvt. Ltd., New Delhi.
2   M.K. Jain, S.R.K. Iyengar and Jain R.K (2012), Numerical Methods for Scientific
3   and Engineering Computation, New Age International Publishers, New Delhi.
4   T. Veerarajan and T. Ramachandran (2008), Numerical Methods with Programs in C, Tata McGraw-Hill Publishing company limited, New Delhi.

Websites

1   https://youtu.be/tcqsLqlyjmk
2   https://youtu.be/0XcOwBY_Ryw

SEMESTER-I
PROGRAMMING IN C - PRACTICAL

4H -2C

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

Course Objectives
- To introduce students to the basic knowledge of programming fundamentals of C language.
- To impart writing skill of C programming to the students and solving problems.
- To understand problem statements and identify appropriate solutions.
- To demonstrate the use of IDE and C Compiler.
- To impart the concepts like looping, array, functions, pointers, file, structure.
- To develop programs using C Programming Language.

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

COs	Course Outcomes	Blooms Level
CO1	Apply the concept of Control Structures to solve any given problem.	Apply
CO2	Apply the concept of single and multi-dimensional arrays to solve problems related to searching, sorting and matrix operations.	Apply
CO3	Apply the concept of Strings for writing programs related to character array.	Apply
CO4	Write programs using concept of user defined and recursive functions.	Analysis
CO5	Apply concept of structures to write programs.	Apply

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS   **48 HOURS**

1. Write a C program to find roots of a Quadratic equation.
2. Write a C program to find the total no. of digits and the sum of individual digits of a positive integer.
3. Write a C program to generate the Fibonacci sequence of first N numbers.
4. Write a C program to compute Sin(x) using Taylor series approximation given by

   $$Sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \ldots\ldots$$

5. Compare output of the program with the built-in Library function. Print both the results with appropriate messages.
6. Write a C program to arrange the elements of an integer array using Bubble Sort algorithm.
7. Write a C program to search for an element in an array using Binary Search algorithm and print appropriate message.
8. Write a C program to input two matrices and perform matrix multiplication on them.
9. Write a C program to check whether the given string is palindrome or not without using Library functions.
10. Write a C program to count the number of lines, words and characters in a given text.
11. Write a C program to generate Prime numbers in a given range using user defined function.
12. Write a C program to find factorial of a given number using recursive function.
13. Write a C program to maintain a record of n student details using an array of structures with four fields -Roll number, Name, Marks and Grade. Calculate the Grade according to the following conditions.

Marks	Grade
>=80	A
>=60	B
>=50	C
>=40	D
<40	E

    Print the details of the student, given the student Roll number as input.

Suggested Readings
1   E. Balaguruswamy, "Programming in ANSI C", 8th Edition, 2019, McGraw Hill Education, ISBN: 978-93-5316-513-0.
2   Pradip Dey, Manas Ghosh, "Programming in C", 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.
3   Kernighan B.W and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, 2015, Pearson Education India, ISBN: 978-93-3254-944-9.
4   Yashavant P. Kanetkar, "Let Us C", 16th Edition, 2019, BPB Publications, ISBN: 978-93- 8728-449-4.
5   Jacqueline A Jones and Keith Harrow, "Problem Solving with C", Pearson Education. ISBN: 978-93-325-3800-9
Websites
1   http://elearning.vtu.ac.in/econtent/courses/video/BS/14CPL16.html
2   https://nptel.ac.in/courses/106/105/106105171
3   http://elearning.vtu.ac.in/econtent/courses/video/BS/14CPL16.html
4   https://nptel.ac.in/courses/106/105/106105171/

BACHELOR OF COMPUTER SCIENCE (AI & DS)   **2023-2024**

SEMESTER-I
OFFICE AUTOMATION - PRACTICAL

6H -3C

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

Course Objectives
- To 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
- To improve creative thinking in presentation software.
- To create organizational charts in PowerPoint.

Course Outcomes

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

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS: **72 HOURS**

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.

Suggested Readings

1. Sanjay Saxena. (2019). A First Course in Computers (Based on Windows 8 And MS Office 2013) Vikas Publishing.
2. R. Gabriel Gurley.(2018). A Conceptual Guide to OpenOffice.org 3, CreateSpace Independent Publishing Platform.
3. Alexis Leon, Mathews Leon, and Leena Leon, VijayNicole (2018). Introduction to Information Technology - Imprints Pvt. Ltd.
4. R. Gabriel Gurley. (2017). A Conceptual Guide to OpenOffice.Org 2 for Windows and Linux
5. John Walkenbach, HerbTyson, FaitheWempen, CaryN.Prague, Michael R, Groh, Peter G.Aitken, and Lisa A.Bucki, (2017). Microsoft Office 2017 Bible - Wiley India Pvt.ltd.
6. P. K. Sinha .(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/powerpointbeginnertutorial.pdf

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SEMESTER-I
ENVIRONMENTAL STUDIES

2H -2C

Instruction Hours / Week: 2 T: 0 P: 0   **Marks:** Internal: **40**   External: **60** Total: **100**
End Semester Exam: 3 Hours

Course Objectives
The main objectives of the course are

- To create awareness about environmental problems among people
- To develop an attitude of concern for the environment
- To motivate public to participate in environment protection and improvement
- To learn about the environment, resources available, biodiversity and its conservation
- To understand the current scenarios to find ways for protection and betterment of our habitat
- To understand the concepts and methodologies to analyze the interactions between social and environmental processes

Course Outcomes
The learners will be able to

COs	Course Outcomes	Blooms Level
CO1	Understand the concepts and methods from ecological and physical sciences and their application in environmental problem solving	Understand
CO2	Study the concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions	Understand
CO3	Learn the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems	Apply
CO4	Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales	Apply
CO5	Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes	Apply

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I   Introduction - Environmental Studies & Ecosystems: 4 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 ground water.

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: 5 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).

SUGGESTED READINGS:

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 ed.). New Age International Pvt. Ltd. Publications, NewDelhi.
3. Arvind Kumar. 2009. A Textbook of Environmental Science. APH Publishing Corporation, New Delhi.
4. Botkin., and Keller. 2014. Environmental Science: Earth as a Living Planet. (9th ed.)Wiley
5. Mishra, D.D. 2010. Fundamental Concepts in Environmental Studies. S.Chand & Company Pvt. Ltd., NewDelhi.
6. Odum,E.P., Odum, H.T. and Andrews, J. 1971. Fundamentals of Ecology. Philadelphia: Saunders.
7. Rajagopalan,R.2016.EnvironmentalStudies:FromCrisistoCure,OxfordUniversityPress.
8. Sing, J.S., Sing. S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand &Publishing Company, NewDelhi.
9. Singh, M.P., Singh, B.S., and Soma, S. Dey. 2004. Conservation of Biodiversity and Natural Resources. Daya Publishing House, NewDelhi.
10. Tripathy. S.N., and Sunakar Panda. (2011). Fundamentals of Environmental Studies (3rded.). Vrianda Publications Private Ltd, NewDelhi.
11. Uberoi, N.K. 2010. Environmental Studies. (2nded.). Excel Books Publications, NewDelhi.
12. Verma, P.S., and Agarwal V.K. 2016. Environmental Biology (Principles of Ecology).S. Chand and Company Ltd, NewDelhi.
13. Environmental Biotechnology: Principles and Applications, Second Edition 2nd Edition by Bruce Rittmann and Perry McCarty , 2020

SEMESTER-II
ACTIVITY/LIBRARY/SEMINAR

2H -0C

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

SEMESTER-II
LANGUAGE-II

4H -4C

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

பாடத்திட்டப் பொதுநோக்கம்

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

பாடத்திட்டப் பயன்விளைவு

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

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

இலக்கிய நெறிகள்

அலகு – I   **(8 மணிநேரம்)**

நாயன்மார்கள்: தமிழ் இலக்கிய வரிசையில் திருமுறைகளும் நாலாயிரத் திவ்யப்பிரபந்தமும் – பன்னிரு திருமுறைகள் அறிமுகம் – திருமுறை ஆசிரியர்களின் இலக்கியப் பங்களிப்பு

சைவம்-பெரியபுராணம் - காரைக்கால் அம்மையார் புராணம் .

முக்கூடற்பள்ளு - 2 பாடல்கள் - சித்திரக்காலிவாலான் (நெல் வகைகள்)

                 குற்றாலத் திரிகூடமால்வரை (மீன்வகைகள், காளை வகைகள்)

கவிதை: மகாகவி பாரதியார் - யோகசித்தி

கவிதை: கவிமணி தேசிக விநாயகம் பிள்ளை -வாழ்க்கைத் தத்துவங்கள்

கவிதை: கவிஞர் சுகந்திசுப்பிரமணியம் - புதையுண்டவாழ்க்கை

சிறுகதை: மகாமசானம் - புதுமைப்பித்தன்

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

அலகு– 2   **(12 மணிநேரம்)**

ஆழ்வார்கள் : 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. அத்தனைபொத்து.

சிறுகதை : ஆர். சூடாமணி - அந்நியர்கள்

கட்டுரை : ஆளுமைத்திறன் அறிவோம்- தன்னம்பிக்கை மாத இதழிலிருந்து

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 - ஒளவைதுரைசாமி   - 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.வாலின் குரங்கு, 4.தவளே இவள், 5.சுரக்கும் திருவருட், 6.வதிவாய் விளைபயில்,7.உறைவான், 8.பச்சைப்பேர், 9.வித்தகம், 10.துணையாய், 11.கலந்தார்.

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.

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

SEMESTER-II
ENGLISH II

3H-3C

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

EndSemesterExam:3Hours

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

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

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

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT-I   **7 HOURS**

Listening	**:** Listening for Pleasure (Poetry)
Speaking	**:** Developing speaking skills
Reading	**:** Reading strategies
Writing	**:** Developing a story with pictures
Literature	**:** Refuge Mother and Child by Chinua Achebe
Grammar	**:** Voice

UNIT- II   **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
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

Books for References

1. Oxford Handbook of Writing: St. Martins Handbook of Writing 2013 Cambridge University Press
2. Sound Business, Julian Treasure 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

SEMESTER-II
OBJECT ORIENTED PROGRAMMING

5H -4C

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

End Semester Exam: 3 Hours

Course Objectives

- The objective of this course is to provide the student with the fundamental knowledge and skills to become a proficient C++ programmer.
- To understand the major object-oriented concepts to implement inheritance and polymorphism.
- To learn file handling in C++.
- To understanding the multithreading, exception handling concepts in Java.
- To create Java GUI applications with AWT concepts

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Understand the difference between top-down and bottom-up approach of Structural and Object-Oriented Programming.	Understand
CO2	Apply the concepts of object-oriented programming using C++ and Java.	Apply
CO3	Understand how to apply the major object-oriented concepts to implement inheritance and polymorphism.	Apply
CO4	Apply formatting in IO and file handling concepts in C++	Apply
CO5	Understanding the multithreading, exception handling concepts in Java	Understand
CO6	Understand how to create GUI with AWT in Java.	Understand

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I Introduction to Object Oriented Programming   **10 HOURS**

Object Oriented Programming : 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   10 HOURS

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

UNIT III Templates and Files: 10HOURS

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

UNIT IV Java Basics   10 HOURS

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

UNIT V Packages and AWT   10 HOURS

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

Suggested Readings
1   Antonio Mallia, Francesco Zoffoli, 2019. C++ Fundamentals, Packt Publishing, Ltd.
2   Joel Murach, Mary Delamater, 2018. C++ Programming, Mike Murach& Associates Inc.
3   Stefan Bjornander, 2016. C++ Windows Programming, Published by Packt Publishing Ltd.
4   Richard L. Stegman, 2016. Focus on Object-oriented Programming with C++, 6th Edition, CreateSpace Independent Publishing Platform.
5   Herbert Schildt, Java the Complete Reference, 8th Edition.
6   E. Balaguruswamy, 2009, Programming with Java, 4th Edition, McGraw Hill.

Websites
1   www.programmingsimplified.com
2   https://nptel.ac.in/courses/106105191/
3   www.programiz.com /cpp -programming
4   www.cplusplus.com
5   https://docs.oracle.com/en/java/
6   https://www.geeksforgeeks.org/java-tutorial/

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SEMESTER-II
DISCRETE STRUCTURES

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4H -4C

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Course Objectives

- To learn the basic concepts of sets, types of sets, functions and relations
- To understand about Pigeonhole principle, Permutation and Combination, Mathematical Induction
- To solve the problems using Recurrence relations and generating functions.
- To know the basic concepts of Logical Connectives, Graphs and Trees.
- To express ideas using mathematical notation and to solve problems with the help of mathematical analysis tool.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Familiar with elementary algebraic set theory.	Understand
CO2	Acquire a fundamental understanding of the core concepts in growth of functions.	Apply
CO3	Describe the method of recurrence relations	Apply
CO4	Get wide knowledge about graphs and trees	Analysis
CO5	Initiate to knowledge from inference theory and to Solve problems with the help of mathematical analysis tool	Apply

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I **8 HOURS**

Prepositional Logic: Prepositions-Truth tables -Logical Connectives-Wellformed Formulas-Demorgan's Law-Tautologies and Contradictions-PDNF and PCNF–Equivalences-Inference Theory-Rules of universal specification and generalization.

UNIT II **8 HOURS**

Sets: Introduction - Finite and infinite sets - Uncountably infinite sets - Relations and its types -Properties of Binary Relations – Closure - Partial Ordering Relations - Definition of Functions and its classification– Types of functions-Composition of functions.

UNIT III   **7 HOURS**

Combinatorics: Pigeon hole principle-Permutation and Combination-Mathematical Induction –Principle of Inclusion and Exclusion.

UNIT IV   **7 HOURS**

Recurrences: Recurrence Relations - Generating Functions - Linear Recurrence Relations with Constant Coefficients and their Solution.

UNIT V   **10 HOURS**

Graph Theory: Introduction - Basic Terminology - Graph Representation - Types of graphs - Multigraphs and Weighted Graphs - Graph Isomorphism – Connectivity - Euler and Hamiltonian Paths and Circuits-Trees-Basic Terminology and Properties of Trees.

Suggested Readings

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

Websites

1   https://youtu.be/u4IQh46VoU4
2   https://youtu.be/fZqfkJ-cb28
3   https://www.youtube.com/watch?v=6WGWFwgXhd4
4   https://www.youtube.com/watch?v=HmQR8Xy9DeM
5   https://www.youtube.com/watch?v=_-QZQNSmIpw

SEMESTER-II
OBJECT ORIENTED PROGRAMMING-PRACTICAL

4H -2C

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

Course Objectives

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

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Understand the difference between top-down and bottom-up approach.	Understand
CO2	Apply the concepts of object-oriented programming in constructor and destructor.	Apply
CO3	Understand how to apply the major object-oriented concepts to implement inheritance and polymorphism.	Understand
CO4	Apply pointer concepts in C++	Apply
CO5	Use the concepts of preprocessor directives and macros.	Apply

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS: **40 HOURS**

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 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.

Suggested Readings

1   Antonio Mallia, Francesco Zoffoli,2019, C++ Fundamentals, Packt Publishing, Ltd.
2   Joel Murach, Mary Delamater, 2018, C++ Programming, Mike Murach & Associates Inc.
3   Bjarne Stroustroup, 2014, Programming - Principles and Practice using C++, 2nd Edition, Addison-Wesley.
4   Stefan Bjornander, 2016, C++ Windows Programming, Published by Packt Publishing Ltd.
5   Richard L. Stegman, 2016, Focus on Object-oriented Programming with C++, 6th Edition, CreateSpace Independent Publishing Platform.
6   Harry, H. Chaudhary, 2014, Head First C++ Programming: The Definitive Beginner's Guide, First Create space Inc, O-D Publishing, LLC USA.
7   Debasish Jana, 2014, C++ And Object-Oriented Programming Paradigm, Published by PHI Learning Pvt. Ltd

Websites

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

SEMESTER-II
WEB PROGRAMMING - PRACTICAL

6H -3C

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

Course Objectives

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

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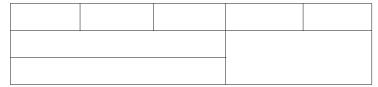At the end of this course, students will be able to

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

Mapping with Programme Outcomes

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

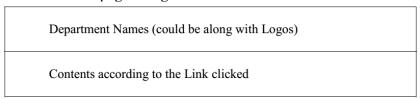**S-Strong; M-Medium; L-Low**

LIST OF PROGRAMS: 60 HOURS

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 Roll No, 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 web page using Inline Cascading Style Sheet.
9. To create a web page 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 Java Script program to compute squares and cubes of numbers from 5 to 15.
12. To write Java Script program to find the largest of three numbers.

13. To write Java Script program to find the factorial of a number.
14. To write Java Script program to calculate sum and average of numbers.
15. To write Java Script program to count the number of negative numbers, positive numbers and zeros in the list.
16. To write Java Script program to prompt username and display it.

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

Websites
1   https://developer.mozilla.org/enUS/docs/Web/JavaScript/Guide.
2   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/

SEMESTER II
INDIAN KNOWLEDGE SYSTEM

2H -2C

Instruction Hours / Week: L: 2 T: 0 P: 0 **Marks:** Internal: **40** External: **60** Total: **100**
End Semester Exam: 3 Hours

Course Objectives

To make the students

- To understand the Indian knowledge systems about origin, evolution and ontological approach
- To comprehend the Indian knowledge approaches with respect to time and language
- To obtain key knowledge on life and mind of Indian knowledge system
- To acquire key information on torchbearers of Indian knowledge system
- To attain strong knowledge on the role of Women in ancient and modern India

Course Outcomes
Learners should be able to

COs	Course Outcomes	Blooms Level
CO1	Understand the rich heritage that resides in our traditions.	Understand
CO2	Comprehend the Indian knowledge	Understand
CO3	Understand the importance of philosophical concepts	Understand
CO4	Understand the origin of Indic thought and practices	Understand
CO5	Understand role of Women in ancient and modern India.	Understand

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I   2 HOURS

Tradition - Conception and Constitution of Knowledge in Indian Tradition, The Oral Tradition, Knowledge Maintenance and Renewal Mechanisms, Nature and Character of Knowledge, Models and Methods of Indian Knowledge Systems, Nature and Conception of Reality, Means of Knowledge of Reality –Uniqueness of Indian Ontology and Epistemology.

UNIT II   2 HOURS

Time and Language - Time – Concept of Kala, Cycles of Time, Measurement of Time, Knowledge of Time – the Science of Light. Language – Philosophy of Word and Meaning, The Sphota Doctrine, Sadhu and Asadhu words, Levels of Speech, Silence as the eternal language.

UNIT III

Environment and Management - Environment – Concept of Nature in Indian Tradition, Panchbhutas – Elements of Nature, Concept of Rta, Sacred Environment, Panchvati. Management – Indian conception of Economy and Management, Insights from Arthashastra, Management by Consciousness.

UNIT IV   2 HOURS

Life and Mind - The Science of Life – History and Basic Principles of Ayurveda, Prana, Ojas and Tejas, Health, Balance and Routine in Ayurveda. The Science of Mind – Origin, Nature and Evolution of Yoga, Types and Schools of Yoga, Yoga Darshana.

UNIT V   2 HOURS

Torchbearers - Ancient – Sankara, Nanak, Tulsi, Caitanya. Modern – Dayananda, Ramakrishna, Sri Aurobindo, Ananda Coomaraswamy. Women's Empowerment in India: Ancient Period to Modern Time Period.

Suggested Readings:
1. B. Mahadevan, Vinayak Rajat Bhat, and Nagendra Pavana R.N. (2022). *Introduction to Indian Knowledge System: Concepts and Applications* (1st ed.). PHI Publishers, New Delhi, India.

Websites
https://iks.iitgn.ac.in/wp-content/uploads/2016/01/Indian-Knowledge-Systems-Kapil-Kapoor.pdf
https://www.sanskritimagazine.com/india/traditional-knowledge-systems-of-india/

SEMESTER-II
ACTIVITY/LIBRARY/SEMINAR

2H -0C

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

SEMESTER-II
LANGUAGE-III

4H -4C

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

End Semester Exam: 3 Hours

தமிழ் இலக்கியவரலாறு- தாள் 3,

பாடத்திட்ட பயன் விளைவு

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

பாடத்திட்டப் பொது நோக்கம்

1. இந்தியக் குடியுரிமைப்பணி முதலான போட்டித் தேர்வுகளில், விருப்பப்பாடமாக இடம்பெறுகின்ற,'தமிழ் இலக்கியவரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
2. கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வு மனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
3. தமிழின் வளர்ச்சித்துறையாகிய, 'அறிவியல் தமிழ்' ; 'இணைய தமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச்சிந்தனை மேம்பாடு.
4. வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
5. சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி. மொழிபெயப்புத் துறைசார்ந்த வேலைவாய்புத்திறன் பெற்றிருத்தல்

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

அலகு:1 சங்க இலக்கியம்   (8 மணிநேரம்)

Karpagam Academy of Higher Education (Deemed to be University), Coimbatore - 641 021.

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   (12 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 ஐம்பெரும் 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, பதினான்கு 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 என்றமைந்த தமிழின் ஐந்திலக்கணக் கொள்கைகள் – நன்னூல் - தொல்காப்பியம் - யாப்பருங்கலக்காரிகை - புறப்பொருள் வெண்பாமாலை – நம்பி அகப்பொருள் முதலான இலக்கண நூல் சிந்தனைகள்.

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

பார்வை நூல்கள்:

Karpagam Academy of Higher Education (Deemed to be University), Coimbatore - 641 021.

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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 மாநூர் 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

SEMESTER-II
ENGLISH III

3H -3C

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

Course Objectives

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

Course Outcomes

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

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

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I   **6 HOURS**

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

UNIT II   6 HOURS
Speaking: Essentials of effective Communication- **Telephone Skills**: Understanding Telephone Conversation-Handling Calls-Leaving Messages-Making Requests-Giving Instructions and Orders.

UNIT III   6 HOURS
Reading: Reading with a purpose-Skimming and Scanning-Locating Main Points-Reading Critically- Sequencing of Sentences-Reading Comprehension

UNIT IV   6 HOURS
Writing: Descriptive and Narrative-Safety Instructions- Suggestions-Expansion of Abbreviations-Spellings Rules
Translation- Translating Short Sentences and Passages from English to Tamil

UNIT V   6 HOURS
Vocabulary: Synonyms-Antonyms-Prefixes-Suffixes- Idioms- Different Types of English-Homonyms and Homophones (British and American)

Suggested Readings
1. Oxford Handbook of Writing: St. Martins Handbook of Writing 2013 Cambridge Universiity 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.

BACHELOR OF COMPUTER SCIENCE (AI & DS)   **2023-2024**

SEMESTER-III
OPERATING SYSTEMS

5H -4C

Instruction Hours / Week: L: 5 T: 0 P: 0   **Marks:** Internal:**40** External:**60**   Total: **100**
End Semester Exam: 3 Hours

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

Course Outcomes
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	Analysis
CO5	Describe and analyze the memory management and its allocation policies.	Apply

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I Introduction to Operating System   **12 HOURS**

Introduction-Basic OS Functions-Types of OS: Multi programming Systems-Batch Systems-Time Sharing Systems- Real Time Systems. Computer System Structures: Computer System operation-I/O Structure-Storage Structure- Storage Hierarchy.

UNIT II Operating System Structures and Process Management: **12 HOURS**
System Components-Operating System Services-System Calls-System Programs-System Structures. Processes**:** Process Concept- Process Scheduling-Inter Process Communication. Threads: Multithreading Models- Thread issues.

UNIT III Process Management   **13 HOURS**
CPU Scheduling: Basic concepts- Scheduling Algorithm-Multiple-preprocessor scheduling-real time scheduling**. Process Synchronization:** Critical section problem-Synchronization hardware-semaphore. **Deadlocks:** System Model- Deadlock characterization– Dead lock Prevention-Deadlock Avoidance – Deadlock Recovery.

UNIT IV Storage Management   **12 HOURS**
Memory Management: Swapping- Paging-Segmentation- Segmentation with Paging. **Virtual Memory**: Demand Paging-Process Creation-Page replacement Allocations of Frame-Thrashing.
File System Interface: File Concept- Accept Method-Directory Structure-File system monitoring-file sharing.

UNIT V Protection and Security   **11 HOURS**
Protection: Goals of Protection-Domain of Protection-capability based systems-Language based protection
Security: Security Problem-User Authentication-Program Threats-System Threats-Security systems and facilities.

Suggested Readings
1   Silberschatz, A., Galvin, P.B. ,&Gagne,G.(2018). Operating Systems Concepts, 10thEdition ,New Delhi, John Wiley Publications.
2   Stallings, W.(2016). Operating Systems, Internals & Design Principles 7th Edition. New Delhi: Prentice Hall of India.
3   Jose M Garrido , Richard Schlesinger Kenneth Hoganson. (2015). Principles of Modern Operating Systems,2ndEdition, 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

SEMESTER-III
DATA STRUCTURES

4H -4C

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

Course Objectives
- To understand the fundamental concepts of data structures
- To Learn linear data structures lists, stacks, and queues
- To apply Tree and Graph structures
- To understand sorting, searching and hashing algorithms
- To develop application using data structures

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

COs	Course Outcomes	Blooms Level
CO1	Determine appropriate data structure as applicable to specified problem definition	Applying
CO2	Apply the concept of stack, queue and linked list	Applying
CO3	Construct a tree and perform various operations on a tree along with implementation	Applying
CO4	Examine the solution for solving various computing problems using graph data structure	Analyzing
CO5	Illustrate sorting and searching techniques	Understanding

Mapping with Programme Outcomes

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

UNIT I Arrays and Stacks   **10 HOURS**
Definition, Structure and properties of algorithm – Development of an algorithm – data structures and algorithms – Data Structure definition and classification – **Arrays:** Introduction – array operations – Number of elements in an array – Representation of arrays in memory – Applications of arrays. **Stacks:** Introduction- Stack Operations - Applications of stacks: Evaluations of postfix expressions.

UNIT II Queues and Linked Lists   **8 HOURS**

Queues: Introduction – Operations on queues – Circular Queues – Other types Queue – Application of Linear queues: Time sharing system– **Linked Lists:** Introduction – Singly linked lists - Circularly linked lists - Doubly Linked Lists – Application of Linked List-Polynomial addition.

UNIT III Trees   **12 HOURS**

Tree: Introduction – Trees Definitions and basic terminologies – representation of tress - **Binary Trees:** Basic terminologies and types - Representation of Binary Trees – Binary tree traversals – Threaded of Binary Tree – Applications of Tress- Expression trees.

UNIT IV Graphs   **8 HOURS**

Introduction – Graph terminology – Representation of Graphs –Operations on Graphs – Applications of Graph - Topological Sort – Minimum Spanning Tree – Finding Shortest paths - Articulation Points, Bridges, and Biconnected Components, strongly connected components – Eulerian Tour – Hamiltonian Tour.

UNIT V Sorting, Searching and Hashing   **10 HOURS**

Sorting: Introduction – Bubble sort – Selection sort –Insertion Sort – Bucket / Radix Sort - Merge Sort – Quick Sort – Heap Sort – Tree sort – Shell Sort – **Searching:** Linear – Binary search – Merging. **Hashing:** Introduction – Direct Address table - Hash Table – Hash Function – Resolving collisions: Synonyms Chaining– Open Addressing - Rehashing.

Suggested Readings

1   R. S. Salaria, "Data structures & Algorithms Using C", 5th Edition, Khanna Book Publishing Co.Pvt. Ltd.,SRS Enterprises, New Delhi, 2022.
2   Alfred V. Aho, Jeffrey D. Ullman,John E. Hopcroft ,Data Structures and Algorithms, 1st edition, Pearson, 2002
3   Jean Paul Tremblay and Paul G. Sorensen, An Introduction to Data Structures with Applications, 2nd Edition, Tata McGraw Hill, New Delhi, 2017
4   Vijayalakshmi Pai G.A, Data Structures and Algorithms – Concepts, Techniques and Applications, 1st Edition, McGraw Hill Education, New Delhi, 2017.
5   Seymour Lipschutz, Data Structures McGraw Hill Publications, 2014, 1st Edition

Websites

1   https://www.cs.usfca.edu/~galles/visualization/Algorithms.html
2   https://www.docsity.com/en/data-structures-and-algorithm-explaination-and-types/8851110/

SEMESTER-III
OPERATIONS RESEARCH

4H -4C

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

End Semester Exam: 3 Hours

Course Objectives

- To learn the basic concepts and applications of linear programming and to impart knowledge in concepts and tools of Operations Research.
- To know the constructive techniques to make effective business decisions
- To define and formulate linear programming problems and appreciate their limitations
- To Identify and develop operational research models from the verbal description of the real system
- To Solve network models like the shortest path, minimum spanning tree, and maximum flow problems

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Understand the basic concepts and application of operation research in various fields and to analyze managerial problems in industry so that they are able to use resources (capitals, materials, staffing, and machines) more effectively	Understand
CO2	Define and formulate linear programming problems and appreciate their limitations	Applying
CO3	Recognize the importance and value of Operations Research and mathematical modelling in solving practical problems in industry	Understand
CO4	Identify and develop operational research models from the verbal description of the real system	Analyzing
CO5	Solve network models like the shortest path, minimum spanning tree, and maximum flow problems	Understand

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I   9 HOURS

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

Unit-II   9 HOURS

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

Unit-III   10 HOURS

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

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

Unit-IV   10 HOURS

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

UNIT -V   10 HOURS

PERT AND CPM
Introduction - Network scheduling by PERT / CPM – Network and basic components – Rules of Network construction – Time calculation in Networks – CPM. PERT – PERT calculations – Cost Analysis– Crashing the Network – Problems.

Suggested Readings

1. Kandiswarup,P.K.GuptaandManMohan.(2011).OperationsResearch,12thRevisededition,S. Chand &Sons Education Publications, New Delhi.
2. Sharma S.D., (2017). Operations Research Theory, Methods & Applications, Kedar Nath Ram Nath Publications, India.
3. Hamdy A. Taha. (2012). Operations Research-An Introduction, Nineth edition, published by Dorling Kindersley (India)Pvt. Ltd., licensees of Pearson Education in South Asia.
4. Prem Kumar Gupta and HiraD.S., (2014). Operations Research, S.Chand & Company Ltd,Ram Nagar, New Delhi.
5. Srinivasan G.,(2017).Operations Research: Principles and Applications, PHI, New Delhi

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

BACHELOR OF COMPUTER SCIENCE (AI & DS)   **2023-2024**

SEMESTER-III
OPERATING SYSTEMS-PRACTICAL

3H -1C

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

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

Course Outcomes
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	Understand 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.	Analysis
CO5	Identify use and evaluate the storage management policies with respect to different storage management technologies.	Apply

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS: 36 HOURS

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.

Suggested Readings

1. Silberschatz, A., Galvin, P.B. ,&Gagne,G.(2018). Operating Systems Concepts, 10thEdition ,New Delhi, John Wiley Publications.
2. Stallings, W.(2016). Operating Systems, Internals & Design Principles 7th Edition. New Delhi: Prentice Hall of India.
3. Jose M Garrido , Richard Schlesinger Kenneth Hoganson. (2015). Principles of Modern Operating Systems,2ndEdition, 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

SEMESTER-III
DATA STRUCTURE USING PYTHON -PRACTICAL

3H -1C

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

Course Objectives
- To understand the main components of a python & their functions.
- To study the process management and scheduling.
- To study the need for special purpose python with the advent of new emerging technologies
- To implement the scheduling and process management algorithms.
- To implement the spanning tree-Prim's Algorithm to produce the better result.

Course Outcomes

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

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS: **36 HOURS**

1. Implementation of Tower of Hanoi using stack

2. Implementation of FCFS (First Come First Serve) using Queue

3. Implementation of Traffic Light Control System using Circular Linked List

4. Implementation of Binary Search Algorithm

5. Implementation of quick sorting Algorithm

6. Implementation of Minimum cost spanning tree-Prim's Algorithm

7. Implementation of Minimum Cost Spanning tree-Kruskal's Algorithm

8. Implementation of Huffman's code

Suggested Readings

1   Vasudevan, S. K., Nagarajan, A. S., Nanmaran, K. (2020). Data Structures Using Python. India: Oxford University Press.
2   Baka, B. (2017). Python Data Structures and Algorithms. United Kingdom: Packt Publishing.
3   Goodrich, M. T., Tamassia, R., Goldwasser, M. H. (2013). Data   Structures   and Algorithms in Python. United Kingdom: Wiley.
5

Websites

1   https://jovian.com/learn/data-structures-and-algorithms-in-python
2   https://www.udacity.com/course/data-structures-and-algorithms-in-python--ud513
3   https://onlinecourses.nptel.ac.in/noc22_cs26/preview

SEMESTER-III
HEALTH & WELLNESS

2H -2C

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

End Semester Exam: 3 Hours

Course Objectives

- To introduce the fundamental concepts of physical education, health and fitness.
- To provide a general understanding on nutrition, first aid and stress management.
- To familiarize the students regarding yoga and other activities for developing fitness.
- To create awareness regarding hypo-kinetic diseases, and various measures of fitness and health assessment.
- To understand the importance and benefits of yoga

Course Outcomes

After successful completion of the course, the student will be

COs	Course Outcomes	Blooms Level
CO1	Able to describe the principles of health and wellness from an interdisciplinary perspective	Understand
CO2	Able to think and act ethically in the context of health, nutrition and wellness.	Analyze
CO3	Acquire knowledge about the benefits of physical activity, nutrition for health	Understand
CO4	Create awareness among the public about the importance of health	Understand
CO5	Understand role of yoga practices	Understand

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I: 5 HOURS

Definition and concept of health -biomedical concept, ecological concept, psyco social concept, holistic concept. Dimensions of health – physical, mental Health; causes and consequences of mental conflicts and frustrations; Introduction to common mental disorders: Insomnia, Depression, Stress, Anxiety disorders, Social, Spiritual, Emotional, Vocational and other

dimensions. Determinants of health - biological, environmental factors, behavioral and socio culture.

UNIT II: 5 HOURS

Basic concept of nutrition. Food intake and regulations, calorific value of food, dietary need and recommended dietary allowances. Assessment of nutritional status - energy value of carbohydrates, proteins and fats. Balanced diet. Healthy foods: Healthy diet, for adults, infants and young children, aged adults. Food pyramid. Factors influencing eating behaviour. Concepts of food safety and standards, Food Preservation.

UNIT III: 5 HOURS

Lifestyle Disease and its Management: Types, Risk Factors, Diagnosis, and Prevention - Heart Disease, Obesity, Type 2 Diabetes, Stroke, Hypertension. Stress management, Prevent Lifestyle Diseases - Maintaining a Balance Between Physical Activity and Food Consumption. Opting for Periodic Health Check-ups. Consequences of alcohol and drug misuse

UNIT IV: 5 HOURS

Importance and Scope of Physical Education -Modern concept of health, physical fitness and wellness. Exercise and weight loss, Exercises for a healthy heart, regular exercise for mental health -workout plan - myths about exercise and aging, Tips for using a fitness device. Cardiorespiratory Fitness, Musculoskeletal Fitness.

UNIT V: 5 HOURS

Benefits and Importance of yoga in our life – Pranayama – Surya Namaskar-Padmasana-Pachimothasana- Bhujangasana- Dhanurasana -Sarvangasana -Matsyasana- Salabhasan Halasana-Chakrasana- Vrikshasana- Padahastasana– Savasana

Suggested Reading:

1. Benu Gupta, Mukesh Agarwal and Sunita Arora (2019).A Textbook on Physical Education and Health Education: Fitness, Wellness and Nutrition.
2. Manjari Chandra (Author) (2020). Eat Up, Clean Up: Your Personal Journey To A Healthy Life
3. Srilakshmi B (2014). Nutrition Science: New Age International (P) Ltd. Publishers. 4th edition. New Delhi
4. Yogeswar (2021).Everyday Yoga: An Illustrated Guide to H: An Illustrated Guide to Healing

SEMESTER-III
INTERNSHIP*

0H -2C

Instruction Hours / Week: 0 T: 0 P: 0   Marks: Total: **100 End Semester Exam: 3 Hours**

SEMESTER-III
ACTIVITY/LIBRARY/SEMINAR

2H -0C

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

SEMESTER-IV
LANGUAGE -IV

4H -4C

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

தமிழர் நாகரிகமும் பண்பாடும் - தாள் 4

பாடத்திட்ட பயன் விளைவு

1. வரலாற்றிற்கு முற்பட்ட தமிழகத்தை மாணவர்களுக்கு அறிமுகப்படுத்துதல்.

2. பழந்தமிழர் பண்பாடு சார்ந்த வாழ்க்கை முறையை மாணவர்கள் அறிய ஊக்குவித்தல்.

3. தமிழ்மொழியின் பழைமையும், திராவிட மொழிகளில் தமிழ்மொழியின்னிச்சிறப்பையும் மாணவர்களுக்கு அறிமுகப்படுத்துதல்.

4. தமிழர்களின் வாழ்வியல், தமிழர் கலைகள், ஆற்றங்கரைப் பண்பாடுகள் குறித்து மாணவர்கள் அறியச் செய்தல்.

5. இந்தியக் குடியுரிமைப் பணி முதலான போட்டித் தேர்வுகளில் விருப்பப் பாடமாக இடம்பெறுகின்ற தமிழ் நாகரிகமும் பண்பாடும் குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.

பாடத்திட்டப் பொது நோக்கம்

1. இந்தியக் குடியுரிமைப்பணி முதலான போட்டித் தேர்வுகளில், விருப்பப்பாடமாக இடம்பெறுகின்ற, 'தமிழ்இலக்கியவரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.

2. கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வு மனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.

3. தமிழின் வளர்ச்சித்துறையாகிய, 'அறிவியல்தமிழ்';'இணையதமிழ்' குறித்த பன்னோக்கு அணுகுமுறையிலான ஆய்வுச்சிந்தனை மேம்பாடு.

4. வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .

5. சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி. மொழிபெயப்பூத் துறைசார்ந்த வேலைவாய்புத்திறன் பெற்றிருத்தல்

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

அலகு – I வரலாற்றுக்கு முற்பட்ட தமிழகமும் சங்ககால வரலாறும் (8 மணிநேரம்)

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

அலகு – 2   தமிழின் தொன்மை   (8 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   (8 மணிநேரம்)

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

அலகு – 4   கட்டடக்கலையும் தமிழர் பண்பாடும்   (8 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.

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

SEMESTER-IV
COMMUNICATIVE ENGLISH

3H -3C

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

Course Objectives

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

Course Outcomes

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

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

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT-I **6 HOURS**
Concept of Communication- Barriers to Communication- Body Language-Personality Development - Etiquette and Manners-Soft Skills

UNIT- II **6 HOURS**
Listening Comprehension-Reading Comprehension-Paragraph Writing-Precis Writing-Collocation

UNIT-III   **6 HOURS**
Writing-Writing Resume and Covering Letter- Types of Letter Writing-Writing MoU- Dicto Composition--Term Paper-Book Reviews

UNIT- IV   **6 HOURS**
Speaking-Interview Skills-Preparing Welcome address and Vote of Thanks-Compering

UNIT-V   **6 HOURS**
Punctuation Marks- Figures of Speech

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

Karpagam Academy of Higher Education (Deemed to be University), Coimbatore - 641 021.

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SEMESTER-IV
FUNDAMENTALS OF DATA SCIENCE

4H -3C

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

                                      End Semester Exam: 3 Hours

Course Objectives
The objective of this course is 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.
- To obtain the knowledge in data management tools.
- To explore the major techniques for data science.

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

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

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I- Introduction   10 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. MySQL)

UNIT II- Sampling   8 HOURS
Sampling – Probability Models for Statistical Methods: Discrete and continuous probability distributions, density functions. Random variables, expected values, variance, correlation.

UNIT III- Data Normalization   6 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   7 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   9 HOURS
Business Intelligence–Descriptive Analytics, Diagnostic Analytics, Predictive Analytics, Prescriptive Analytics–Cloud computing-definition, Cloud services, types of clouds, some of commercial and non-commercial cloud service providers.

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

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
5. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-0002-introduction-to-computational-thinking-and-data-science-fall-2016/

SEMESTER-IV
RELATIONAL DATABASE MANAGEMENT SYSTEM

4H -4C

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

End Semester Exam: 3 Hours

Course Objectives

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

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Demonstrate an understanding of the elementary features of RDBMS	Understand
CO2	Design conceptual models of a database using ER modeling for real life applications	Understand
CO3	Analyze the existing design of a database schema and apply concepts of normalization to design an optimal database	Analysis
CO4	Able to develop structured query language (SQL) queries to create, read, update, and delete relational database	Apply
CO5	Retrieve any type of information from a data base by formulating complex queries in SQL.	Analysis

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I – Introduction   **10 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   **8 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   **7 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   **8 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   **7 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

Suggested Readings

1 ElmasriRamez and Navathe Shaman. (2019). Fundamentals of Database System', Pearson Education , Sixth Edition.
2 Abraham Silberschatz, Henry F.Korth and S.Sudarshan. (2018). Database System Concepts', Tata Mc Graw Hill,Sixth Edition.
3 Ivan Bayross. (2018). SQL, PL/SQL the Programming Language of Oracle Paperback. BPB Publication, Fifth   Edition.
4 ParteekBhatia. (2016). PL/SQL for Beginners: A Simplified Approach, Kindle Edition.

5 C.J.Date, A.Kannan and S.Swamynathan. (2015). An Introduction to Database Systems. Pearson Education ,Eighth Edition.

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/

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SEMESTER-IV
CYBER SECURITY

</div>

3H -3C

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

Course Objectives
- To state the basic concepts in Cyberspace, Cybersecurity issues and challenges
- To provide an exposure to the classification of Cybercrimes and, Remedial and mitigation
- To understand principles of Social Media Overview and Security
- To gain knowledge about E-Commerce and Digital Payments
- To understand key terms and concepts Digital Device Security tools

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

COs	Course Outcomes	Blooms Level
CO1	Students would be able to understand the concept of Cyber Security and issues and Challenges associated with it.	Understand
CO2	Students should be able to understand the cybercrimes, their nature, legal remedies and how report the crimes through available platforms and procedures	Understand & Apply
CO3	Students should be able to appreciate various privacy and security concerns on online social media and understand the reporting procedures.	Understand
CO4	Students able to understand the basic concepts related to E-commerce and digital payments.	Understand
CO5	Students will be able to understand the basic security aspects related to computer and mobiles	Understand & Apply

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I Introduction to Cyber security   **6 HOURS**

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

UNIT II Cybercrime and Cyber law   **6 HOURS**

Classification of cybercrimes, Common cybercrimes- cybercrime targeting computers and mobiles- cybercrime against women and children- financial frauds- social engineering attacks, malware and ransomware attacks, zero day and zero click attacks- Cybercriminals modus-operandi Reporting of cybercrimes- Remedial and mitigation measures-Legal perspective of cybercrime- IT Act 2000 and its amendments-Cybercrime and offences ,Organizations dealing with Cybercrime and Cyber security in India-Case studies.

UNIT III Social Media Overview and Security   **6 HOURS**

Introduction to Social networks- Types of Social Media-Social Media Platforms-Social media monitoring, Hashtag, Viral content, Social media Marketing-Social media privacy, Challenges, opportunities and pitfalls in online social Network-Security issues related to social media-Flagging and reporting of inappropriate Content-Laws regarding posting of inappropriate content, Best practices for the use of Social media- Case studies.

UNIT IV E-Commerce and Digital Payments   **6 HOURS**

Definition of E- Commerce-Main components of E-Commerce- Elements of E-Commerce security- E-Commerce threats-E-Commerce security best practices-Introduction to digital payments- Components of digital payment and stake holders-Modes of digital payments-Banking Cards, Unified Payment Interface (UPI), e-Wallets, Unstructured Supplementary Service Data (USSD), Aadhar enabled payments, Digital payments related common frauds and preventive measures- RBI guidelines on digital payments and customer protection in unauthorized banking transactions- Relevant provisions of Payment Settlement Act,2007,

UNIT V Digital Devices Security, Tools and Technologies for Cyber Security 6 HOURS

End Point device and Mobile phone security- Password policy- Security patch management- Data Backup-Downloading and management of third party software- Device security policy- Cyber Security best practices- Significance of host firewall and Ant-virus- Management of host firewall and Anti-Virus-Wi-Fi security- Configuration of basic security policy and permissions.

Suggested Readings

1. Nina Godbole & SUNIT Belapure. (2013). CYBER SECURITY. Wiley India Pvt. Ltd. New Delhi
2. Godbole, N. (2009). Information Systems Security: Metrics Frameworks and Best Practices. Wiley India. New Delhi
3. Cyber Crime Impact in the New Millennium, by R. C Mishra , Auther Press. Edition 2010.

4. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011)
5. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform. (Pearson, 13th November, 2001)
6. Electronic Commerce by Elias M. Awad, Prentice Hall of India Pvt Ltd.
7. Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant Publishers.
8. Network Security Bible, Eric Cole, Ronald Krutz, James W. Conley, 2nd Edition, Wiley India Pvt. Ltd.
9. Fundamentals of Network Security by E. Maiwald, McGraw Hill.

Websites
1. www.cybercrime.gov.in
2. https://gac.gov.in/
3. https://www.india.gov.in/password-policy-ministry-electronics-and-information-technology?page=3
4. https://mahe.gov.in/mobile-app-policy/

SEMESTER-IV
PROBABILITY AND STATISTICS

4H -4C

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

End Semester Exam: 3 Hours

Course Objectives

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

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	compute problems based on probability and conditional probability in Appropriate ways.	Understand
CO2	describe the probability distributions such as Binomial, Poisson and Normal distribution.	Understand & apply
CO3	Evaluate various measures of descriptive statistical measures for any given data.	Understand
CO4	Derive the relationship between data using Correlation, Rank Correlation and Regression for two variables.	Analyze
CO5	Understand the basic concept of test of significance and make inferences from statistical tests and also to develop an ability to analyze, demonstrate and to provide meaningful information in from the collected statistical data.	Understand & apply

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I Basics of Probability   8 HOURS

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

UNIT II Discrete and Continuous Probability Distributions   8 HOURS

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

UNIT III Basics of Statistics and Uni Variate Analysis   8 HOURS

Meaning and definition of statistics-Frequency Distribution, Concepts of measurement, scales of measurement of data, Different types scales (ratio, interval, nominal and ordinal); Measures of central tendency: Arithmetic Mean, Median, Mode. Measures of dispersion – Range, Coefficientofrange-Quartiledeviation-CoefficientofQuartiledeviation-StandarddeviationandCoefficientof variation.

UNIT IV Bivariate Analysis   8 HOURS

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

UNIT V Index Numbers   8 HOURS

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

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

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_JcleDbrVyP nE0PixKs2JE
3. https://nptel.ac.in/courses/110107114/
4 http://172.16.25.76/course/view.php?id=1642

SEMESTER-IV
FUNDAMENTALS OF DATA SCIENCE -PRACTICAL

3H -1C

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

End Semester Exam: 3 Hours

Course Objectives
- To study the basic concepts of Data Science and data lifecycle.
- To identify and apply the concepts in data collection, sampling and probabilistic models.
- To learn common random variables and their uses, and with the use of empirical distributions.
- To obtain the knowledge in data management tools.
- To explore the major techniques for data science.

Course Outcomes (COs)
At the end of this course, students will be able to

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

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

1. Matrix manipulations.

2. Creating and manipulating a List and an Array.

3. Manipulation of vectors and matrix.

4. Operators on Factors in R

5. Working with looping statements.

6. Find subset of dataset by using subset (), aggregate () functions on iris dataset

7. Find the data distributions using box and scatter plot.

8. Find the correlation matrix and plot the correlation plot on dataset and visualize it

Suggested Readings

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

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
5. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-0002-introduction-to-computational-thinking-and-data-science-fall-2016/

SEMESTER-IV
RELATIONAL DATABASE MANAGEMENT SYSTEMS-PRACTICAL

3H -1C

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

                                                End Semester Exam: 3 Hours

Course Objectives

- To understand the role and nature of relational database management systems (RDBMS) in today's IT environment.
- To understand need for normalization.
- To convert conceptual data models into relational database schemas using the SQL Data Definition Language (DDL).
- Query and manipulate databases using the SQL Data Manipulation Language (DML).
- To acquire Programming and Software Engineering skills and techniques using SQL and PL/SQL.
- To create PL/SQL applications.

Course Outcomes (COs)

COs	Course Outcomes	Blooms Level
CO1	Enhance the knowledge and understanding of Database analysis and design.	Understand
CO2	Enhance the knowledge of the processes of Database Development and Administration using SQL and PL/SQL.	Understand
CO3	Enhance Programming and Software Engineering skills and techniques using SQL and PL/SQL.	Analysis
CO4	Use the PL/SQL code constructs of IF-THEN-ELSE and LOOP types as well as syntax and command functions.	Apply
CO5	Solve Database problems using Oracle SQL and PL/SQL	Understand

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

List of Programs   **30 HOURS**

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

		Character	30
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.

9. 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 item code varchar2(10), item name varchar2(50), current_stock number(5), date_of_last_purchase date. Write a stored procedure to seek for an

item using item code 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

Suggested Readings

1. Elmasri Ramez and Navathe Shaman. (2019). Fundamentals of Database System', Pearson Education , Sixth Edition.
2. Abraham Silberschatz, Henry F.Korth and S.Sudarshan. (2018). Database System Concepts', Tata Mc Graw Hill,Sixth Edition.
3. Ivan Bayross. (2018). SQL, PL/SQL the Programming Language of Oracle Paperback. BPB Publication, Fifth   Edition.
4. ParteekBhatia. (2016). PL/SQL for Beginners: A Simplified Approach, Kindle Edition.
5. C.J.Date, A.Kannan and S.Swamynathan. (2015). An Introduction to Database Systems. Pearson Education ,Eighth Edition.

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/

SEMESTER-IV
ACTIVITY/LIBRARY/SEMINAR

2H -0C

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

SEMESTER-V
FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE

6H -5C

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

Course Objectives

- To gain a historical perspective of AI and its foundations.
- To become familiar with basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning.
- To investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
- To experience AI development tools such as 'AI language', expert system shell, and/or data mining tool.
- To experiment with a machine learning model for simulation and analysis.
- To explore the current scope, potential, limitations, and implications of intelligent systems.

Course Outcomes

COs	Course Outcomes	Blooms Level
CO1	Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.	Understand
CO2	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.	Understand
CO3	Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.	Analysis
CO4	Demonstrate proficiency developing applications in an 'AI language', expert system shell, or data mining tool.	Apply
CO5	Demonstrate proficiency in applying scientific method to models of machine learning.	Apply

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I -Introduction to AI   **15 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   **13 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   **13 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   **10 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   **9 HOURS**
Expert Systems: Representing and Using Domain Knowledge, Shell, Explanation, Knowledge
Acquisition.

Suggested Readings
1. Russell, S. and Norvig, P. (2021). Artificial Intelligence: A Modern Approach,
   4th Edition, Prentice Hall.
2. Professor Lewis Brown. (2019). Applied Artificial Intelligence.
3. Patterson (2015) .Introduction to Artificial Intelligence. Pearson Education.
4. Elaine Rich, Kevin Knight, Shivasankar B. Nair. (2014) Artificial Intelligence The
   McGraw Hill publications, 4th Edition.
5. 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-
   Module-1-Fundamentals-of-AI.pdf
3. https://www.ics.uci.edu/~dechter/courses/ics-171/fall-06/lecture-notes/intro-class.ppt
4. https://nptel.ac.in/courses/112/103/112103280/
5. https://study.com/academy/topic/fundamentals-of-artificial-intelligence.html

SEMESTER-V
DATA VISUALIZATION

6H -5C

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

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

Course Outcomes
Upon completion of this course students will be able to:

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

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I-Creating Visual Analytics with tableau   15 HOURS
Creating Visual Analytics with tableau desktop, connecting to your data-How to Connect to your data, what are generated Values? Knowing when to use a direct connection, joining tables with tableau, blending different data sources in a single worksheet.

UNIT II-Building your first Visualization   **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   **12 HOURS**

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

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

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

UNIT V-Developing an Adhoc analysis   **13HOURS**

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

Suggested Readings:
1. Daniel G. Murray and the Inter works BI team . (2019). Tableau your data. Wiley Publications
2. Joshua N. Millign. (2019).Learning Tableau -2019.3rd Edition- Packt publications Student Activity
3. Ashutosh Nandeshwar. (2018). Tableau Data Visualization Cookbook , PACKT publishing.
4. Alexandru C. Telea. (2017). Data Visualization principles and practice. 2nd Edition, CRC Publications
5. Noah Iliinsky, Julie Steele (2011) Designing Data Visualizations: Representing Informational Relationships
6. NussbaumerKnaflic (2014). Storytelling with Data: A Data Visualization Guide for Business Professionals.

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

SEMESTER-V
CLOUD COMPUTING

6H -5C

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

Course Objectives

- To learn about the concept of cloud and utility computing.
- To have knowledge on the various issues in cloud computing.
- To be familiar with the lead players in cloud.
- To appreciate the emergence of cloud as the next generation computing paradigm.
- To differentiate the cloud platform and software environment.

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

COs	Course Outcomes	Blooms Level
CO1	Articulate the main concepts, key technologies, strengths and limitations of cloud computing.	Understanding
CO2	Identify the architecture, infrastructure and delivery models of cloud computing.	Analyze
CO3	Explain the core issues of cloud computing such as security, privacy and interoperability.	Understanding
CO4	Choose the appropriate technologies, algorithms and approaches for the related issues.	Applying
CO5	Demonstrate the use of cloud platforms and software environments.	Applying

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I – Introduction   **10 HOURS**

Introduction to Cloud Computing ― Definition of Cloud ― Evolution of Cloud Computing―Underlying Principles of Parallel and Distributed Computing–Cloud Characteristics–Elasticity in Cloud―On-demand Provisioning.

UNIT II - Virtualization   **14 HOURS**

Basics of Virtualization – Types of Virtualizations – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices –Desktop Virtualization – Server Virtualization.

UNIT III – Cloud Enabling Technologies and Infrastructure   **10 HOURS**

Service Oriented Architecture – RESTful Web Services – NIST Cloud Computing Reference Architecture – IaaS – PaaS – SaaS – Public, Private and Hybrid Clouds – Cloud Storage –Design Challenges in Cloud – Peer-to-Peer Architecture.

UNIT IV- Resource Management and Security in Cloud   **14 HOURS**

Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges – Software-as- a-Service Security – Security Governance – Virtual Machine Security.

UNIT V- Programming Models   **12 HOURS**

Parallel and Distributed programming Paradigms – MapReduce – Hadoop – Mapping Applications – Google App Engine – Amazon AWS – Cloud Software Environments – Eucalyptus – Open Nebula – Open Stack.

SUGGESTED BOOKS

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things",Morgan Kaufmann Publishers,2012.
2. James E.Smith, RaviNair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann,2005.
3. Toby Velte, Anthony Velte,Robert Elsenpeter,"Cloud Computing-APractical Approach",TMH,2009.
4. John W.Ritting house and James F.Ransome, "Cloud Computing: Implementation "Management, and Security",CRCPress,2010.
5. Rajkumar Buyya, Christian Vecchiola,S. Thamarai Selvi "Mastering Cloud Computing",Tata Mcgraw Hill,2013.
6. GeorgeReese,"Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond(Theory in Practice), O'Reilly,2009.

WEB LINKS:

1. https://www.javatpoint.com/introduction-to-cloud-computing

2. https://www.knowledgehut.com/blog/cloud-computing/what-is-cloud-computing
3. https://www.tutorialspoint.com/cloud_computing/cloud_computing_overview.htm
4. https://www.futurelearn.com/info/blog/introduction-to-cloud-computing

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SEMESTER-V
DATA COMMUNICATION AND NETWORKS

</div>

4H -4C

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

Course Objectives

- To study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model.
- To read the fundamentals and basics concepts of Physical layer with real time examples
- To study data link layer concepts, design issues, and protocols.
- To learn the functions of network layer and the various routing protocols.
- To familiarize the functions and protocols of the Transport layer and Application layer.

Course Outcomes (COs)

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

COs	Course Outcomes	Blooms Level
CO1	Understand the functions of each layer in OSI and TCP/IP model.	Understanding
CO2	Explain the multiplexing, switching concept and types of transmission media with real time examples.	Analyze
CO3	Understand the error detection and can implement the data link layer protocols	Understanding
CO4	Learn different medium access method to avoid collision and to learn about routing table.	Applying
CO5	Learn basic functionalities of transport layer and application layer	Applying

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I -Introduction to Data Communication　　　　　　　　　**10 HOURS**

An Overview – Data Communication – Network – The Internet - Protocols and Standards. Network Models: Layered Task - The OSI Model and Layers – TCP/IP Protocol Suite – Addressing. **Physical Layer:** Analog and Digital Signals – Periodic and Non-Periodic Signals -Transmission Impairments - Performance.

UNIT II   9 HOURS
Analog to Digital conversion - digital to analog conversion – Transmission Modes; multiplexing techniques- Frequency Division Multiplexing –Wavelength Division Multiplexing – Time division Multiplexing. Transmission media: Guided Media – Unguided Media. **Switching:** Circuit-switched Networks – Datagram Network – Virtual-Circuit Networks.

UNIT III -Data Link Layer   10 HOURS
Error detection and error correction - data-link control- framing- flow and error control – protocols –Noisy channels: Simplest Protocol – Stop–and–Wait Protocol; and Noiseless Channels: Stop–and–Wait Protocol ARQ – Go-Back-N Automatic repeat request – Selective Repeat Automatic Repeat Request – Piggybacking.

UNIT IV -Multiple Access Protocol   10 HOURS
Random Access: Aloha – CSMA – CSMA/CD – CSMA/CA – Controlled Access: Reservation – Polling – Token Passing. **Networks Layer**: IPv6 Address -Delivery-Forwarding- **Unicast routing protocols:** Intra- and Inter domain Routing -Distance Vector Routing-Link state Routing- Path Vector Routing – Multicast Routing.

UNIT V -Transport Layer   9 HOURS
Process-to-Process Delivery: Connectionless versus Connection-oriented Service – Reliable versus unreliable – User datagram protocol –Transmission control Protocol. Congestion control and Quality of service: Data Traffic – Congestion Control – Techniques to improve QoS.. **Application layer:** Domain Name Space – E-Mail- FTP- WWW- HTTP.

Suggested Readings
1. Forouzan,B. A. (2019). Data Communications and Networking .6thEdition.New Delhi: THM.
2. Alberto Leon-Garcia, Indra Widjaja (2017). Communication Network .4thEdition.Mc Graw Hill Education.
3. Sathish Jain, Madhulika Jain, Vineeta Pillai, Kratika. (2016). A Level Data Communication & Network Technologies. BPB Publication.
4. Tanenbaum, A. S. (2016). Computer Networks**.**7thEdition.New Delhi: PHI.

Websites
1. http://docwiki.cisco.com/wiki/Introduction_to_WAN_Technologies
2. www.w3schools.com/tcpip/default.asp
3. http://www.engppt.com/2009/12/networking-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
6. https://nptel.ac.in/courses/106105183/
7. http://172.16.25.76/course/view.php?id=1831

SEMESTER-V
MOBILE COMPUTING

4H -4C

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

Course Objectives
- To know about the intricacies of wireless communication
- To study about the popular cellular networking technologies
- To learn about widely used wireless LAN technologies
- To explore the various protocols that support mobility at network layer and transport layer
- To learn the principles of mobile application development

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

COs	Course Outcomes	Blooms Level
CO1	To articulate the concept of wireless communication	Understanding
CO2	To have knowledge on the architecture of GSM and LTE protocol	Analyze
CO3	To choose the appropriate WLAN technology for a given scenario	Understanding
CO4	To deploy various protocols that support mobility at network layer and transport layer	Applying
CO5	To design and implement mobile applications	Applying

UNIT I – Wireless Communication   **9 HOURS**
Frequencies and Regulations - Signals - Antennas - Propagation Ranges and Effects - Multipath Propagation - Effects of Mobility - Multiplexing - Modulation and Shift Keying - Spread Spectrum - Frequency Hopping and Direct Sequence - Evolution of Wireless Telephony.

UNIT II – Telecommunication Networks   **9 HOURS**
Cellular System - Cellular Network Structure and Operation - Principles - Tessellation, Frequency Reuse, Hand off - GSM - System Architecture, Elements, Interfaces, Frame Structure, Protocol Stack, Types of Handover – CDMA - UMTS and IMT-2000 - Architecture, User Equipment, RNS, UTRAN, Node B, RNC functions - W-CDMA - HSPA+, HSUPA, HSDPA+

UNIT III – Wireless LAN   **10 HOURS**
Need and Advantages - Applications - IEEE 802.11 WLAN - Architecture, Protocol stack - Physical layer - MAC Layer - CSMA/CA, Virtual Carrier Sense, Fragmentation and Reassembly , Inter Frame Spacing - Security - WEP - 802.1x Authentication - Synchronization - Power management- ETSI HIPERLAN - Characteristics, Services, Protocols - Physical Layer - Channel Access Control - Bluetooth - PHY and MAC layers

UNIT IV- Mobile Network and Transport Layer   **10 HOURS**
Mobile IP - IPv6 Mobility Features - Mobility header, Mobility options - Ad hoc networks - AODV and DSDV Protocols - Limitations of traditional TCP - Indirect TCP - Snoop TCP - Mobile TCP - Different Approaches in Transmission and Retransmission - Explicit Link Failure Notification - Wireless Transport Layer Security (WTLS)

UNIT V- Mobile Application Development   **10 HOURS**
Three Tier Architecture - Presentation Tier - Application Tier and Data Tier – Google Android Platform – Eclipse Simulator – Android Application Architecture – Apple iPhone Platform – UI Tool Kit Interfaces – Event Handling – Event based Programming – Storing and Retrieval of data.

Suggested Readings
1. Jochen Schiller,"MobileCommunications",SecondEdition,Pearson,2009.
2. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, "Mobile Computing Technology, Applications and Service Creation",2ndedition, Tata Mc Graw Hill,2010.
3. William Stallings, "Wireless Communication and Networks", Pearson Education,2009.
4. Uwe Hansmaan ,Lothar Merk, Martin S. Nicklons and Thomas Stober,'Principles of Mobile Computing',Springer,2003.
5. Pattnaik Prasant Kumar and Mall Rajib,"Fundamentals of Mobile Computing", PHI,2012
6. Zigurd Mednieks, Laird Dornin, G, Blake Meike and Masumi Nakamura, "ProgrammingAndroid",O"Reilly,2011.

Websites
1. https://www.javatpoint.com/mobile-computing
2. https://www.tutorialspoint.com/mobile_computing/mobile_computing_overview.htm
3. https://www.techtarget.com/searchmobilecomputing/definition/nomadic-computing
4. https://www.analyticssteps.com/blogs/introduction-mobile-computing

SEMESTER-V
BASICS OF ACCOUNTING

6H -5C

Course Objectives
To make the students
- To understand basic concepts on accounting
- To prepare various subsidiary books
- To prepare financial statements
- To carry out depreciation on fixed assets
- To prepare accounts for nonprofit organizations

Course Outcomes
Learners should be able to

COs	Course Outcomes	Blooms Level
CO1	Understand basic concepts on accounting	Understand
CO2	Prepare various subsidiary books	Understand
CO3	Prepare financial statements	Apply
CO4	Carry out depreciation on fixed assets	Apply
CO5	Prepare accounts for nonprofit organizations	Apply

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I   **14 HOURS**
Accounting – Definition- Fundamentals of Book Keeping – Branches of Accounting – Nature of Accounts - Accounting Concepts and Conventions – Journal – Ledger.

UNIT II   **14 HOURS**
Subsidiary books – Introduction – Types of subsidiary books - purchases book - sales book- returns book - cash book - single column cash book – Two column cash book - Three column Cash book - petty cash book

UNIT III   **14 HOURS**
Trial balance - Errors and their rectification - Final accounts of a sole trader with adjustments - Trading and Profit and Loss Account - Balance Sheet – Difference between Profit and Loss Account and Balance Sheet.

UNIT IV   14 HOURS

Depreciation- Definition- Methods of depreciation- straight line method- written down value method- annuity value method- sinking fund method- provisions and reserves

UNIT V   14 HOURS

Accounts for Non Profit organization- Receipts and Payments and income and expenditure account and Balance sheet – Difference between Receipts and Payments and income and expenditure account and Balance sheet

Note: Distribution of Marks between problems and theory shall be 75% and 25%.

Suggested Readings

1. N.Vinayakam, P.L.Maniam and K.L.Nagarajan , (2012)Principles of Accountancy New Delhi .S.Chand& Company Ltd
2. S. P. Jain & K. L. Narang, 2010, Advanced Accountancy, Sultan Chand & Sons. New Delhi
3. T.S.Grewal,(2011)Introduction to Accountancy, New Delhi S.Chand & Company Ltd.
4. R.L.Gupta, V.K.Gupta and M.C.Shukla,2010, New Delhi Financial Accounting, Sultan Chand .
5. T.S.Grewal, S.C.Gupta and S.P.Jain, 2010, New Delhi Advanced Accountancy, Sultan Chand .
6. K.L.Narang and S.N.Maheswari ,2010, New Delhi Advanced Accountancy-Kalyani Publishers.

SEMESTER-V
FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE – PRACTICAL

5H -2C

Instruction Hours / Week: L: 0 T: 0 P: 5 Marks: Internal: **40**   External: **60** Total: **100**
End Semester Exam: 3 Hours

Course Objectives
- To become familiar with basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning.
- To investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
- To experience AI development tools such as an 'AI language', expert system shell, and/or data mining tool.
- To experiment with a machine learning model for simulation and analysis.
- To explore the current scope, potential, limitations, and implications of intelligent systems.

Course Outcomes

COs	Course Outcomes	Blooms Level
CO1	Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.	Understanding
CO2	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.	Analyze
CO3	Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.	Understanding
CO4	Demonstrate proficiency developing applications in 'AI language', expert system shell, or data mining tool.	Applying
CO5	Demonstrate proficiency in applying scientific method to models of machine learning.	Applying

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS: **60 Hours**

1. Write a pandas program to add, subtract, multiple and divide two pandas series.
2. Write a pandas program to convert a Numpy array to a pandas series
3. Write a Pandas program to create and display a Data Frame from a specified dictionary data which has the index labels.
4. Write a Pandas program to convert all the string values to upper, lower cases in a given pandas series. Also find the length of the string values.
5. Write a Pandas program to remove whitespaces, left sided whitespaces and right sided whitespaces of the string values of a given pandas series
6. Write a Pandas program to swap the cases of a specified character column in a given Data Frame
7. Write a Pandas program to import csv data (purchase.csv and purchase1.csv) into a Pandas dataframe and perform the following:

   i)   detect missing values and replace the missing values with the most frequent values present in each column of a given DataFrame.
   ii) find the sum, mean, max, min value of purchase_amount
   iii) display the last five rows
   iv) Find the number of orders placed by customer_id 3001
   v)   find a list of customers who had purchased for more than Rs.1000
   vi) sort the records by the ord_date

8. Create an array of employee with details like emp_no,emp_ name, designation, basic pay(BP). Assume DA =25% of BP, HRA = Rs.1500, CCA = Rs.250 and Deduction =10% of BP. Calculate the following:

   i) Calculate the netpay for all employees
   ii) Sort the array by BP
   iii) Find the employee who paid the highest
   iv) Find the min, max and avg salary of the employees.

Suggested Readings

1. Russell, S. and Norvig, P. (2021). Artificial Intelligence: A Modern Approach, 4th Edition, Prentice Hall.
2. Professor Lewis Brown. (2019). Applied Artificial Intelligence.
3. Patterson (2015).Introduction to Artificial Intelligence. Pearson Education.
4. Elaine Rich, Kevin Knight, Shivasankar B. Nair. (2014) Artificial Intelligence The McGraw Hill publications, 4thEdition.
5. 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-Module-1-Fundamentals-of-AI.pdf
3. https://www.ics.uci.edu/~dechter/courses/ics-171/fall-06/lecture-notes/intro-class.ppt
4. https://nptel.ac.in/courses/112/103/112103280/
5. https://study.com/academy/topic/fundamentals-of-artificial-intelligence.html

SEMESTER-V
DATA VISUALIZATION– PRACTICAL

3H -1C

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

End Semester Exam: 3 Hours

Course Objectives

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

Course Outcomes

Upon completion of this course students will be able to

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

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS   **36 HOURS**

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

Suggested Readings:

1. Daniel G. Murray and the Inter works BI team . (2019). Tableau your data. Wiley Publications
2. Joshua N. Millign. (2019).Learning Tableau -2019.3rd Edition- Packt publications Student Activity
3. Ashutosh Nandeshwar. (2018). Tableau Data Visualization Cookbook , PACKT publishing.
4. Alexandru C. Telea. (2017). Data Visualization principles and practice. 2nd Edition, CRC Publications
5. Noah Iliinsky, Julie Steele (2011) Designing Data Visualizations: Representing Informational Relationships
6. Nussbaumer Knaflic (2014). Storytelling with Data: A Data Visualization Guide for Business Professionals.

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

SEMESTER-V
CLOUD COMPUTING– PRACTICAL

3H -1C

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

Course Objectives
- To learn about the concept of cloud and utility computing.
- To have knowledge on the various issues in cloud computing.
- To be familiar with the lead players in cloud.
- To appreciate the emergence of cloud as the next generation computing paradigm.
- To differentiate the cloud platform and software environment.

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

COs	Course Outcomes	Blooms Level
CO1	Articulate the main concepts, key technologies, strengths and limitations of cloud computing.	Understanding
CO2	Identify the architecture, infrastructure and delivery models of cloud computing.	Analyze
CO3	Explain the core issues of cloud computing such as security, privacy and interoperability.	Understanding
CO4	Choose the appropriate technologies, algorithms and approaches for the related issues.	Applying
CO5	Demonstrate the use of cloud platforms and software environments.	Applying

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS   36 HOURS

1. Install Virtualbox/VMware Workstation with different flavours of Linux or windows OS on top of windows8 or 10.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install GoogleAppEngine. Create hello world app and other simple web applications using python/java.
4. Use GAE launcher to launch the web applications.
5. Simulate a cloud scenario using Cloud Sim and run a scheduling algorithm that is not present in Cloud Sim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Find a procedure to launch virtual machine using try stack(Online Open stack Version)
8. Install Hadoop single node cluster and run simple applications like word count.

Suggested Readings
1. Barrie Sosinsky. (2019). Cloud Computing Bible. New Delhi: Wiley-India,
2. Thomas Erl,Zaigham Mahmood(2019).Cloud computing concepts, Technology and Architecture, Prentice Hall
3. Rajkumar Buyya., James Broberg., &Andrzej, M. Goscinski Wile.Cloud Computing: Principles and Paradigms.
4. Nikos Antonopoulos., &Lee Gillam.(2018). Cloud Computing: Principles, Systems and Applications. Springer.
5. Ronald, L. Krutz., &Russell Dean Vines. (2016). Cloud Security: A Comprehensive Guide to Secure Cloud Computing. New Delhi: Wiley-India.
6. Gautam Shroff. (2019).Enterprise Cloud Computing Technology Architecture Applications. Adobe Reader ebooks available from eBooks.com.
7. Toby Velte., Anthony Velte., & Robert Elsenpeter.(2018).Cloud Computing, A Practical Approach. McGraw Hills.
8. Dimitris, N. Chorafas.(2017).Cloud Computing Strategies. CRC Press.

Websites
1. wikipedia.org/wiki/Cloud_computing
2. www.ibm.com/cloud-computing/in/en/
3. www.oracle.com/CloudComputing
4. www.microsoft.com/en-us/cloud/default.aspx
5. https://nptel.ac.in/courses/106105167/
6. http://172.16.25.76/course/view.php?id=1785

SEMESTER- V
INTERNSHIP*

0H -2C

Instruction Hours / Week: L: 0 T: 0 P: 0 Marks: Total: **100End Semester Exam: 3 Hours**

SEMESTER-VI
SOFTWARE ENGINEERING

6H -5C

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

Course Objectives

- To introduce the fundamental concepts of software engineering.
- To Analyze, specify and document software requirements for a software system.
- To Design, select and apply the most appropriate software engineering process for a given project, plan for a software project, identify its scope and risks,
- To estimate cost and time for a software engineering process.
- To expose the criteria for test cases.
- Be familiar with test management and test automation techniques

Course Outcomes

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

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

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I – Introduction   12 HOURS

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

UNIT II - Requirement Analysis   12 HOURS

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

UNIT III - Risk Management & Design Engineering   12 HOURS

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

UNIT IV - Testing Strategies & Tactics   12 HOURS

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

UNIT V - 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

Suggested Readings

1. Pressman, R.S. (2019). Software Engineering: A Practitioner's Approach. 7th edition. New Delhi: McGraw-Hill.
2. Aditya P. Mathur, Foundations of Software Testing (2018). Fundamental Algorithms and Techniques, Dorling Kindersley (India) Pvt. Ltd., Pearson Education.
3. Jalote, P. (2018). An Integrated Approach to Software Engineering. 2nd edition. New Delhi: New Age International Publishers.
4. Aggarwal, K.K., & Singh, Y. (2017). Software Engineering. 2nd edition. New Delhi: New Age International Publishers.
5. Sommerville, I. (2016). Software Engineering. 8th edition. New Delhi: Addison Wesley.
6. Lisa Crispin and Janet Gregory. (2015). Agile Testing: A Practical Guide for Testers and Agile Teams.

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/

BACHELOR OF COMPUTER SCIENCE (AI & DS)   **2023-2024**

SEMESTER-VI
MACHINE LEARNING

6H -5C

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

Course Objectives
- 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**.**
- To recognize the characteristics of machine learning that make it useful to real-world problems.
- To characterize machine learning algorithms as supervised, semi-supervised, and unsupervised.
- To effectively use machine learning toolboxes.

Course Outcomes (COs)

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

COs	Course Outcomes	Blooms Level
CO1	Analyze theory of machine learning components and models	Understanding
CO2	Characterize the algorithms of machine learning to learn linear and non-linear models	Analyze
CO3	Implement data clustering algorithms for machine learning process	Understanding
CO4	Construct machine learning algorithms to learn tree and rule-based models	Applying
CO5	Apply reinforcement machine learning techniques for robotics	Applying

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I - Foundations of Learning   **12 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 and variance – learning curve

UNIT II - Linear Models   12 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   12 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   12 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

Suggested Readings
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.
3. P. Flach. (2017). Machine Learning: The art and science of algorithms that make sense of data, Cambridge University Press.
4. K. P. Murphy. (2017). Machine Learning: A Probabilistic Perspective, MIT Press,
5. 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

BACHELOR OF COMPUTER SCIENCE (AI & DS)   **2023-2024**

SEMESTER-VI
BIG DATA ANALYTICS

6H -5C

Instruction Hours / Week: L: 6 T: 0 P: 0   Marks: Internal: 40 External: 60 Total: 100

End Semester Exam: 3 Hours

Course Objectives
- 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.
- To know about the research that requires the integration of large amounts of data.
- To perform analytics on data streams
- To learn NoSQL databases and management.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Understand the fundamental concepts of big data and analytics	Understand
CO2	Work with big data tools and its analysis techniques	Apply
CO3	Analyze data by utilizing clustering and classification algorithms	Analyze
CO4	Learn and apply different mining algorithms and recommendation systems for large volumes of data	Apply
CO5	Perform analytics on data streams	Apply

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I Introduction to Big Data   **12 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   **12 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   **12 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   **12 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.

Suggested Readings

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.
5. Kim H. Pries and Robert Dunnigan. (2016). Big Data Analytics: A Practical Guide for Managers " CRC Press.
6. 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

SEMESTER-VI
ENTREPRENEURSHIP

6H -5C

Instruction Hours / Week: L: 5 T: 0 P: 0   **Marks:** Internal: **40** External: **60**   Total: **100**
                                          End Semester Exam: 3 Hours

Course Objectives
- To explain concepts of Entrepreneurship and build an understanding about business situations in which entrepreneurs act.
- To qualify students to analyze the various aspects, scope and challenges under an entrepreneurial venture
- To understand the objectives of entrepreneurs
- To discuss the steps in venture development and new trends in entrepreneurship.
- To Correctly collect and analyze Entrepreneurship Development and Government Role

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

COs	Course Outcomes	Blooms Level
CO1	Categorize the foundation of Entrepreneurship Development and its theories.	Analyze
CO2	Learners will explore entrepreneurial skills and management function of a company with special reference to SME sector	Understand
CO3	Identify the type of entrepreneur and the steps involved in an entrepreneurial venture.	Remember
CO4	Apply the new trends in entrepreneurship& starting a venture and to explore marketing methods	Apply
CO5	Examine the Entrepreneurship Development and Government	Apply

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I   Introduction to Entrepreneurship   12 HOURS
Introduction - Entrepreneur - meaning- importance-Qualities, nature, types, traits, culture, similarities and economic and differences between Entrepreneur and Intrapreneur. Entrepreneurship development-its importance- Role of Entrepreneurship -Entrepreneurial environment

UNIT II   Evolution of Entrepreneurs   12 HOURS
Entrepreneurial promotion. Training and developing motivation: factors - mobility of Entrepreneurs - Entrepreneurial change - occupational mobility-factors in mobility - Role of consultancy organizations in promoting Entrepreneurs-Forms of business for Entrepreneurs.

UNIT III Corporate Entrepreneurship   12 HOURS
Creating and starting the venture - Steps for starting a small industry - selection of types of organization - International entrepreneurship opportunities. Need for corporate entrepreneurship, domain of corporate entrepreneurship, conditions favorable for Corporate entrepreneurship, benefits of Corporate entrepreneurship.

UNIT IV   Family and non-family entrepreneur & women entrepreneurs   12 HOURS
Managing, growing and ending the new venture - Family and Non Family Entrepreneur & Women entrepreneurs: Role of Professionals, Professionalism vs family entrepreneurs, Role of Woman entrepreneur, Factors influencing women entrepreneur, Challenges for women entrepreneurs, Growth and development of women entrepreneurs in India

UNIT V   Entrepreneurship Development and Government Role   12 HOURS
Entrepreneurship Development and Government: Role of Central Government and State Government in promoting Entrepreneurship - Introduction to various incentives, subsidies and grants - Export Oriented Units - Fiscal and Tax concessions available. Women Entrepreneurs Reasons for low / no women Entrepreneurs their Role, Problems and Prospects.

Suggested Readings
1   Vasanth Desai " Dynamics of Entrepreneurial Development and Management Himalaya Publishing House,2009.

2   N.P.Srinivasan & G.P.Gupta," Entrepreneurial Development ", Sultan chand &Sons, 2020

3   Paul Burns, Bloomsbury Academic, "Corporate Entrepreneurship And Innovation", 2020.

4   UNNI ,"Women Entrepreneurship In Indian Mid Class", Orient Blackswan Pvt. Ltd,2021.

5   S Anil Kumar , S C Poornima , M K Abraham , K Jayshree ,"Entrepreneurship Development", New Age Publishers; First edition ,2021, NEW AGE International Pvt Ltd.

Websites
1   https://www.udemy.com/topic/cyber-security/
2   https://www.coursera.org/courses?query=cybersecurity
3   https://www.simplilearn.com/cyber-security

2023-2024

SEMESTER-VI
MACHINE LEARNING-PRACTICAL

4H -2C

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

- 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**.**
- To recognize the characteristics of machine learning that make it useful to real-world problems.
- To characterize machine learning algorithms as supervised, semi-supervised, and unsupervised.
- To effectively use machine learning toolboxes.

Course Outcomes(COs)
At the end of this course, students will be able to

CO1	Analyze theory of machine learning components and models	
CO2	Characterize the algorithms of machine learning to learn linear and non-linear models	
CO3	Implement data clustering algorithms for machine learning process	
CO4	Construct machine learning algorithms to learn tree and rule-based models	
CO5	Apply reinforcement machine learning techniques for robotics	
CO1	Analyze theory of machine learning components and models	

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS: **40 HOURS**
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

Suggested Readings
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.
3. P. Flach. (2017). Machine Learning: The art and science of algorithms that make sense of data, Cambridge University Press.
4. K. P. Murphy. (2017). Machine Learning: A Probabilistic Perspective, MIT Press,
5. 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

SEMESTER-VI
BIG DATA ANALYTICS -PRACTICAL

        4H -2C

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

Course Objectives
- To know the fundamental concepts of big data and analytics.
- To explore tools and practices for working with big data
- To learn about stream computing.
- To know about the research that requires the integration of large amounts of data.
- To perform analytics on data streams
- To learn NoSQL databases and management.

Course Outcomes (COs)
      At the end of this course, students will be able to

COs	Course Outcomes	Blooms Level
CO1	Understand the fundamental concepts of big data and analytics	Understand
CO2	Work with big data tools and its analysis techniques	Apply
CO3	Analyze data by utilizing clustering and classification algorithms	Analyze
CO4	Learn and apply different mining algorithms and recommendation systems for large volumes of data	Apply
CO5	Perform analytics on data streams	Apply

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

List of Programs   **40 HOURS**

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

Suggested Readings
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.
5. Kim H. Pries and Robert Dunnigan. (2016). Big Data Analytics: A Practical Guide for Managers " CRC Press.
6. 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

SEMESTER-VI
PROJECT

8H -5C

Instruction Hours / Week: L: 0 T: 0 P: 8   Marks: Internal: 40 External: 60 Total: 100
End Semester Exam: 3 Hours

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SEMESTER-VII
DEEP LEARNING

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6H -4C

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

Course Objectives

- To 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
- To Provide Understanding in the various challenges involved in designing deep learning algorithms for varied application using Image Classification Filters.
- To solve real world applications using Deep learning

Course Outcomes

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

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

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

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 – Vanishing 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

UnitIV-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.

Suggested Readings
1. Navin Kumar Manaswi. (2018). Deep Learning with Applications Using Python, Apress, 1stEdition.
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, Yoshua Bengio and Aaron Courville. (2017). Deep Learning, MIT Press, 1st Edition
5. Phil Kim. (2017). Matlab Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence, APress,3rd Edition.
6. 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

SEMESTER-VII
NATURAL LANGUAGE PROCESSING

6H -4C

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

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

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

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

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I -Introduction to NLP   15 HOURS

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

UNIT II -N-grams Models   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 of Speech 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 – Earley Parsing - 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 Their Senses - Internal Structure - Word Sense Disambiguation -Information Retrieval

UNIT V- Discourse   12 HOURS

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

Suggested Readings

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.htm

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SEMESTER-VII
STATISTICAL COMPUTING

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6H -4C

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

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

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

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

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I   15 HOURS

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

UNIT II   15 HOURS

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

UNIT III   14 HOURS

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

UNIT IV   14 HOURS

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

UNIT V   14 HOURS

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

Suggested Reading

1 Gupta S. P., (2001), Statistical Methods, Sultan Chand & Sons, New Delhi.
2 Gupta S. C., (1974), Statistical Quality Control, Khanna Publishing Co, New Delhi.
3 Mahajan M., (2009), Statistical Quality Control, Dhanpat Rai & Co. (P) Ltd., Educational & Technical Publishers, New Delhi.
4 PillaiR.S.N.,andBagavathiV.,(2002).Statistics,S.Chand&CompanyLtd,NewDelhi.
5 Gupta S. C and Kapoor V. K., (2007), Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi.
6 Montgomery D., (2011), Statistical Quality Control, Wiley India Pvt. Ltd, New Delhi.
7 Leavenworth G., (2015), Statistical Quality Control, Mc - Graw Hill Education Pvt. Ltd., New Delhi.

Web sites

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

SEMESTER-VII
DEEP LEARNING - PRACTICAL

6H -4C

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

Course Objectives
- To 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
- To Provide Understanding in the various challenges involved in designing deep learning algorithms for varied application using Image Classification Filters.
- To solve real world applications using Deep learning

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

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

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS   **72 HOURS**

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.

Suggested Readings

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
5. Phil Kim. (2017). Matlab Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence, APress,3rd Edition.
6. 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

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SEMESTER-VII
NATURAL LANGUAGE PROCESSING - PRACTICAL

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6H -4C

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

Course Objectives

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

Course Outcomes

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

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

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS   **72 HOURS**

    1. Word Analysis
    2. Word Generation
    3. Morphology
    4. N-Grams
    5. N-Grams Smoothing
    6. POS Tagging: Hidden Markov Model
    7. POS Tagging: Viterbi Decoding
    8. Building POS Tagger
    9. Chunking
    10. Building Chunker

Suggested Readings

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
4. http://nlp-iiith.vlabs.ac.in/List%20of%20experiments.html?domain=Computer%20Science

SEMESTER-VIII A
FULL STACK DEVELOPMENT

6H -4C

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

Course Objectives
- To understand the various components of full stack development.
- To learn Node.js features and applications
- To develop applications with MongoDB.
- To understand the role of Angular and Express in web applications
- To develop simple web applications with React

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

COs	Course Outcomes	Blooms Level
CO1	Understand the various stacks available for web application development.	Understand
CO2	Use Node.js for application development	Apply
CO3	Develop applications with MongoDB	Create
CO4	Use the features of Angular and Express	Understand
CO5	Develop React applications	Understand

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I: BASICS OF FULL STACK   **14 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   **14 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   **14 HOURS**

MERN STACK – Basic React applications – React Components – React State – Express REST APIs - Modularization and Webpack - Routing with React Router – Server-side rendering

Suggested Readings

1. Brad Dayley, Brendan Dayley, Caleb Dayley, 'Node.js, MongoDB and Angular Web Development', Addison-Wesley, Second Edition, 2018
2. Vasan Subramanian, 'Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node', Second Edition, Apress, 2019.
3. Chris Northwood, 'The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer', Apress; 1st edition, 2018
4. KirupaChinnathambi, 'Learning React: A Hands-On Guide to Building Web Applications Using React and Redux', Addison-Wesley Professional, 2nd edition, 2018

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

SEMESTER-VIII A
SOCIAL NETWORK ANALYSIS

6H -4C

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

Course Objectives
- To understand the concept of semantic web and related applications.
- To learn knowledge representation using ontology.
- To understand human behaviour in social web and related communities.
- To learn visualization of social networks.
- To Learn about the Social Network Applications

Course Outcomes
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	Create
CO4	Visualize social networks	Create
CO5	Develop Social Network applications	Understand

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I: Introduction **12 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 **12 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   12 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 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.

UNIT IV: Predicting Human Behaviour and Privacy Issues   12 HOURS

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.

Suggested Readings:

1. Peter Mika, ―Social Networks and the Semantic Web‖, First Edition, Springer 2007.
2. Borko Furht, ―Handbook of Social Network Technologies and Applications‖, 1st Edition, Springer, 2010.
3. Guandong Xu, Yanchun Zhang and Lin Li, ―Web Mining and Social Networking – Techniques   and   applications‖,   First   Edition,   Springer,   2011.
4. Dion Goh and Schubert Foo, ―Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively‖, IGI Global Snippet, 2008.

Websites

1.https://www.tutorialspoint.com

2.https://www.researchgate.net/publication/234809062_Ontologies_and_the_Semantic_Web

3. https://www.sciencedirect.com/topics/computer-science/semantic-web-ontology

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SEMESTER-VIII A
ORGANIZATIONAL BEHAVIORS

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6H -4C

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

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Course Objectives
- To make the students to understand the basic concepts of organizational behavior.
- To analyze the individual behavior traits required for performing as an individual or group.
- To obtain the perceiving skills to judge the situation and communicate the thoughts and ideas.
- To understand how to performing group and team and how to manage the power, politics and conflict.
- To recognize the importance of organizational culture and organizational change.

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

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

Mapping with Programme Outcomes

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

 S-Strong; M-Medium; L-Low

UNIT I Organization Behaviour   12 HOURS

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

UNIT II Behaviour And Personality   12 HOURS

Attitudes – Sources - Types - Functions of Attitudes. Values – Importance - Types of Values. Personality – Determinants of personality- Theories of Personality - psycho-analytical, social learning, job-fit, and trait theories.

UNIT III Perception   12 HOURS

Perception – factors influencing perception - Person Perception – Attribution Theory – Frequently Used Shortcuts in Judging Others- Perceptual Process- Perceptual Selectivity - Organization Errors of perception – Linkage between perception and Decision making.

UNIT IV Group and Stress Management   12 HOURS

Foundation of Group Behavior - Types of Groups - Stages of Group Development - Group Norms - Group Cohesiveness – Stress – Causes of stress – Effects of Occupational Stress- Coping Strategies for Stress.

UNIT V Organization Culture and Change   12 HOURS

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

Suggested Readings:

1. Fred Luthans. (2017). Organizational Behavior: An Evidence - Based Approach, 12th edition,McgrawHill Education, NewDelhi.
2. Steven Mcshane and Mary Ann VonGlinow (2017), Organizational Behavior, 6th edition, McGraw Hill Education, NewDelhi
3. Robbins, S. P., and Judge, T.A. (2016). Organizational Behaviour. (16thedition).New Delhi: Prentice Hall of India.
4. Laurie J. Mullins (2016), Management and Organisational behaviour, 10thedition, Pearson Education,NewDelhi
5. Robbins,S.P.,andJudge, T.A.(2016). Essentials of Organizational Behavior. 13th edition, Pearson Education.   th

Websites

1.https://www.tutorialspoint.com

2.https://www.researchgate.net/publication/234809062_Ontologies_and_the_Semantic..

3. https://www.sciencedirect.com/topics/computer-science/semantic-web-ontology

SEMESTER-VIII A
FULLSTACK DEVELOPMENT-PRACTICAL

6H -4C

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

Course Objectives

- To understand the various components of full stack development.
- To learn Node.js features and applications
- To develop applications with MongoDB.
- To understand the role of Angular and Express in web applications
- To develop simple web applications with React

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Understand the various stacks available for web application development.	Understand
CO2	Use Node.js for application development	Apply
CO3	Develop applications with MongoDB	Create
CO4	Use the features of Angular and Express	Understand
CO5	Develop React applications	Understand

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS   60 HOURS

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

Suggested Readings

1. Brad Dayley, Brendan Dayley, Caleb Dayley, 'Node.js, MongoDB and Angular Web Development', Addison-Wesley, Second Edition, 2018
2. Vasan Subramanian, 'Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node', Second Edition, Apress, 2019.
3. Chris Northwood, 'The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer', Apress; 1st edition, 2018
4. Kirupa Chinnathambi, 'Learning React: A Hands-On Guide to Building Web Applications Using React and Redux', Addison-Wesley Professional, 2nd edition, 2018

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

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SEMESTER-VIII A
SOCIAL NETWORK ANALYSIS-PRACTICAL

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6H -4C

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

Course Objectives
- 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.
- To learn visualization of social networks.
- To Learn about the Social Network Applications

Course Outcomes
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.	Create
CO4	Visualize social networks.	Understand
CO5	Develop Social Network Applications	Understand

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

LIST OF EXPERIMENTS   **60 HOURS**

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

Suggested Readings:

1. Peter Mika, ―Social Networks and the Semantic Web‖, First Edition, Springer 2007.
2. Borko Furht, ―Handbook of Social Network Technologies and Applications‖, 1st Edition, Springer, 2010.
3. Guandong Xu ,Yanchun Zhang and Lin Li, ―Web Mining and Social Networking – Techniques and applications‖, First Edition, Springer, 2011.
4. Dion Goh and Schubert Foo, ―Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively‖, IGI Global Snippet, 2008.

Websites

1.https://www.tutorialspoint.com

2.https://www.researchgate.net/publication/234809062_Ontologies_and_the_Semantic..

3. https://www.sciencedirect.com/topics/computer-science/semantic-web-ontology

SEMESTER-VIII B
RESEARCH METHODOLOGY AND IPR

6H -4C

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

Course Objectives
- To impart knowledge and skills required for research methodology.
- To know the Problem formulation, analysis and solutions.
- To acquire knowledge on analysis of the datasets and find the results.
- To know the basic understanding of the Intellectual Rights.
- To explore the Patent drafting and filing patents

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

COs	Course Outcomes	Blooms Level
CO1	Understand the fundamental concepts of research methodology	Understand
CO2	Ability to find the research problem and review on it	Apply
CO3	Understand the various research designs and techniques.	Analyze
CO4	Ability to understand the nature of intellectual property rights and its apply it	Apply
CO5	Ability to understand about IPR and filing patents in R & D	Apply

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I Research Methodology   12 HOURS
Objectives and motivation of research - Types of research - Research approaches – Significanceof research -Research methods verses methodology - Research and scientific method - Importance of research methodology - Research process - Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, necessary instrumentations- Criteria of good research. Defining the research problem: Definition of research problem - Problem formulation - Necessity of defining the problem - Technique involved in defining a problem.

UNIT II Literature Survey and Data Collection   12 HOURS
 Importance of literature survey - Sources of information - Assessment of quality of journals and articles -Information through interne. Effective literature studies approaches, analysis, plagiarism, and research ethics. Data - Preparing, Exploring, examining and displaying.

UNIT III: Research Design and Analysis   **12 HOURS**
Meaning of research design - Need of research design - Different research designs - Basic principles of experimental design - Developing a research plan - Design of experimental set-up - Use of standards and codes. Overview of Multivariate analysis, Hypotheses testing and Measures of Association. Presenting Insights and findings using written reports and oral presentation.

UNIT IV: Intellectual Property Rights (IPR)   **12 HOURS**
Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. Role of WIPO and WTO in IPR establishments, Right of Property, Common rules of IPR practices, Types and Features of IPR Agreement, Trademark, Functions of UNESCO in IPR maintenance.

UNIT V: Patent Rights (PR)   **12 HOURS**
Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System, IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs. Licenses, Licensing of related patents, patent agents, Registration of patent agents.

Suggested Readings
1. Peter S. Menell ,Mark A. Lemley, Robert P. Merges, (2021) "Intellectual Property in the New Technological"Vol. I Perspectives.
2. Laura R. Ford, (2021), "The Intellectual Property of Nations: Sociological and Historical Perspectives on aModern Legal Institution Paperback.
3. R. Ganesan, (2011) "Research Methodology for Engineers", MJP Publishers, Chennai, 2011.
4. RatanKhananabis and SuvasisSaha, (2015) "Research Methodology", Universities Press, Hyderabad.
5. Cooper Donald R, Schindler Pamela S and Sharma JK,(2012) "Business Research Methods", Tata McGrawHill Education, 11Edition.
6. Catherine J. Holland, (2007) "Intellectual property: Patents, Trademarks, Copyrights, Trade Secrets", Entrepreneur Press.
7. David Hunt, Long Nguyen, Matthew Rodgers, (2007) "Patent searching: tools & techniques", Wiley.
8. The Institute of Company Secretaries of India, Statutory body under an Act of parliament,"ProfessionalProgramme Intellectual Property Rights, Law and practice", September 2013.
9. Ranjit Kumar, (2010), 2nd Edition, "Research Methodology: A Step by Step Guide for beginners".

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1.https://www.scribbr.com/dissertation/methodology/
2.https://www.educba.com/types-of-research-methodology/
3.https://www.wipo.int/about-ip/en/

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SEMESTER-VIII B
STATISTICAL ANALYSIS USING R- PRACTICAL
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6H -4C
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Instruction Hours / Week: L: 0 T: 0 P: 6   **Marks: Internal: 40 External: 60 Total: 100**

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End Semester Exam: 3 Hours
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Course Objectives

Upon successful completion of this course, students will be able to:
- 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
- To read Structured Data into R from various sources
- To understand split-apply-combine (group-wise operations) in R
- To perform basic statistical modeling of data using R

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Understand how to install and configure software necessary for a statistical programming environment	Understand
CO2	Work with generic programming language concepts	Apply
CO3	Analyze how reading data into R, accessing R packages, writing R functions, debugging, and organizing and commenting R code is done	Analyze
CO4	Import external data into R for data processing and statistical analysis	Apply
CO5	Design and develop R applications for data analytics	Apply

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS   **60 HOURS**

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

Suggested Readings
1. Garrett Grolemund and Hadley Wickham (2016). R for Data Science
2. Roger.D.Peng, (2015).R Programming for Data Science
3. Hadley Wickham, (2014).Advanced R Programming,1st Edition.
4. Daniel Navarro. (2013). Learning Statistics with R. University of Adelaide Publications.
5. 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

SEMESTER-VIII B
RESEARCH PROJECT / PREPARATION OF RESEARCH PROJECT

18H -12C

Instruction Hours / Week: L: 0 T: 0 P: 18 Marks: Internal: 40 External: 60 Total: 100
End Semester Exam: 3 Hours

VALUE-ADDED COURSES

MOBILE APPLICATION   DEVELOPMENT

COURSE OBJECTIVES
- Develop knowledge about mobile application development.
- Understand the building blocks of mobile apps.
- Gain knowledge about graphics and animations in mobile apps.
- Know about testing of mobile apps.
- Learn the advantages and limitations of development frameworks.
- Understand more about how to distribute apps on mobile market place.

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

COs	Course Outcomes	Blooms Level
CO1	Explain the overview of android with its states and lifecycle.	Knowledge
CO2	Apply the mobile applications for e-marketing in Android and Phone.	Apply
CO3	Analyze mobile databases and various types of testing.	Analyze
CO4	Develop the simple android applications.	Understand
CO5	Evaluate alternative mobile frameworks, and contrast different programming platforms.	Evaluate

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I
Mobility landscape – Mobile platforms – Mobile apps development – Overview of android platform – Setting up the mobile app development environment along with an emulator – A case study on mobile app development

UNIT II

App user interface designing – Mobile UI resources (Layout, UI elements, Draw- able, Menu) – Activity – States and life cycle – Interaction amongst activities – App functionality beyond user interface – Threads, async task, services – States and lifecycle, Notifications, Broadcast receivers.

UNIT III

Telephony and SMS APIs – Native data handling – On-device file I/O – Shared preferences – Mobile databases such as SQLite, and enterprise data access (via Internet/Intranet). Graphics and animation – Custom views – Canvas – Animation APIs – Multimedia – Audio/video playback and record – Location awareness and native hardware access (sensors such as accelerometer and gyroscope).

UNIT IV

Debugging mobile apps – White box testing – Black box testing and test automation of mobile apps – JUnit for android, robotium and monkey talk. Versioning – Signing and packaging mobile apps – Distributing apps on mobile market place. Introduction to objective C – iOS features

UNIT V

UI implementation – Touch frameworks – Location aware applications using core location and map kit – Integrating calendar and address book with social media application – Using WIFI – iPhone market place – Drawbacks on iOS over Android – Various stores available in online market – Configuration ofmobile app – Online ecommerce transaction – E-booking transaction.

Suggested Readings
1 Anubhav Pradhan and Anil V Deshpande, Composing Mobile Apps Wiley,First Edition 2014
2 Barry Burd,Android Application Development All-in-one for Dummies, John Wiley,First Edition 2012

Websites
1 www.impetus.com/mobility
2 www.cise.ufl.edu/~helal/classes/f10/notes/intro_to_mobile.ppt
3 www.diva– portal.org/smash/get/diva2:626531/FULLTEXT01.pdf
4 www.law.fsu.edu/library/databases/ppt/Androidapps.ppt
5 www.infosys.com/flypp/resources/Documents/mobile- application- testing.pdf

INTERNET OF THINGS

Course Objectives

- The goal of this course is for the students is to
- Understand the basics of Internet of Things.
- Identify an idea of some of the application areas where Internet of Things can be applied.
- Infer the middleware for Internet of Things.
- Express the concepts of Web of Things .
- Examine the concepts of Cloud of Things with emphasis on Mobile cloud computing.
- Inspect the IOT security protocols.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Explain about IoT architecture and its applications.	Knowledge
CO2	Identify the feasibility and potential impact of IoT solutions in different industries.	Apply
CO3	Apply a systematic and structured approach to designing IoT solutions.	Apply
CO4	Summarize techniques to secure the elements of an IoT device.	Understand
CO5	Illustrate security protocols in various domains of industrial applications.	Knowledge

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I INTRODUCTION TO IOT

Introduction to IoT – IoT Architectures – Core IoT Functional Stack, Sensors and Actuators Layer, Communications Network Layer, Applications and Analytics Layer – IoT Data Management and Compute Stack, Fog Computing, Edge Computing, Cloud Computing – Sensors, Actuators, Smart Objects, Sensor networks. Middleware for IoT: Overview – Communication middleware for IoT – IoT Information Security, WSN and Sensing Model.

UNIT II IOT COMMUNICATION

Communications Criteria – Access Technologies – IP as IoT Network Layer – Business case – Optimization – Profiles and compliances – Application Protocols – Transport Layer – Application Transport Methods.

UNIT III DESIGN METHODOLOGY

Design Methodology – Case study – Basic blocks of IoT device – Raspberry Pi – Board, Interfaces, Linux, Setting up, Programming – Arduino – Other IoT Devices.

UNIT IV DATA ANALYTICS FOR IOT

Data Analytics for IoT – Big Data Analytics Tools and Technology – Edge Streaming Analytics – Network Analytics Applications. Security history, challenges, variations – Risk Analysis Structures – Application in Operational Environment.

UNIT V IOT IN INDUSTRY

Manufacturing, Architecture, Security Protocols – Utilities, Grid Blocks - Smart Cities, Architecture, Use cases – Transportation, Architecture, Use cases.

Suggested Readings
1   Honbo Zhou "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2013
2   Dieter Uckelmann, Mark Harrison, Florian Michahelles, "Architecting the Internet of Things", Springer Berlin, 2011
3   David Easley, Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning About a Highly Connected World", Cambridge University Press, 2010
4   Olivier Hersent, Omar Elloumi and David Boswarthick,"The Internet of Things: Applications to the Smart Grid and Building Automation", Wiley, 2018
5   Olivier Hersent, David Boswarthick, Omar Elloumi,"The Internet of Things – Key applications and Protocols", Wiley, 2019

Websites
1   https://www.javatpoint.com/iot-internet-of-things
2   https://www.geeksforgeeks.org/introduction-to-internet-of-things-iot-set-1/
3   https://www.tutorialspoint.com/internet_of_things/index.htm
4   https://www.startertutorials.com/blog/physical-design-of-iot.html
5   https://www.guru99.com/iot-tutorial.html

NUTRITION AND DIETETICS

Course Objectives

- To explain the basic concepts of food and nutrition.
- To define the overall classification, function, and source of carbo hydrates ,lipids and proteins.
- To summarize the availability, source, deficiency and physiological role off at and water-soluble vitamins.
- To outline the role of health and nutritional importance of micro and macro minerals.
- To discuss the recent trends and developments in nutrition

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Explain the basics in the are a of nutrition all assessment in health and disease.	Understand
CO2	Outline the biological functions of various macro molecules in terms of food and health.	Understand
CO3	Discuss the balanced diet for healthy life to avoid or prevent the deficiency disorders	Create
CO4	Infer an appropriate diet, products that prevent vitamin deficiency disorders.	Understand
CO5	Identify the proper foods rich in mineral sto live a healthy life.	Analyze

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I: HUMAN NUTRITION

Six classes of nutrients - Historical perspective of nutrient requirements – Assessment of nutritional status - recommended dietary allowances of macronutrients for all agegroups - Assessment of protein quality - Malnutrition and related disorders –Balanced Diet. Factors influencing dietary intake: Food habits, food fads and fallacies, their influence on health and wellbeing.

UNIT II: BIOMOLECULES

Carbohydrates-Definition, classification, Functions, Sources of Carbo hydrates, Deficiency. Lipids – Definition, classification, function, sources, Properties of fats and oils, Refined & Hydrogenated fats process. Proteins-Definitions, Classification, Function, Amino Acids, Sources of Proteins, Texturized proteins.

UNIT III: VITAMINS

Physiological role, bio-availability, requirements, sources and deficiency of Fat Soluble Vitamins: Vitamin A, Vitamin D, E & K. ƒ Water soluble vitamins: Vitamin C, Thiamine, Riboflavin, Niacin, Pantothenic acid, Biotin, Folic acid, Vitamin B12, VitaminB6.Stabilityunderdifferent food processing conditions.

UNITIV: MINERALS AND WATER

Physiological role, bio-availability, requirements, sources and deficiency of Macrominerals: Calcium, Phosphorus Magnesium, Sodium, Potassiumchloride. Microminerals: Iron, Zinc, copper, selenium, chromium, iodine, manganese, Molybdenum and fluoride - Chemistry and physical properties of free, bounded and entrapped water, water activity, quality parameters of drinking and mineral water.

UNIT V: RECENT TRENDS IN NUTRITION

Principles of dietary management in gout, rheumatism,AIDS/HIV-Cancer-risk factors, symptoms, dietary management, role of food in prevention of Cancer. Role of functional foods Health foods and novel foods, organically grown foods, personalized nutrition, recent concepts in human nutrition like nutria genomics, nutraceuticals etc.

Suggested Readings

1 SunetraRoday. Food Science and Nutrition. Oxford Higher Education / Oxford University Press. 3rdedition 2018.(ISBN-13:9780199489084).
2 Charis Galanakis. Nutraceutical and Functional Food Components. Academic Press,1st Edition, 2017. (ISBN:9780128052570).
3 AshleyMartin.Nutrition and Dietetics. Syrawood Publishing House.1st Edition, 2016. (ISBN:9781682860588).
4 Robert E.C.Wildman. Handbook of Nutraceuticals and Functional Foods. CRCPress,2nd Edition, 2016. (ISBN-10: 9781498770637).
5 Srilakshmi. B. Nutrition Science. New Age International Pvt. Ltd, Publishers. 6thEdition.2017.(ISBN-13:9789386418883).

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AGRICULTURAL WASTE AND BYPRODUCTS UTILIZATION

Course Objectives

- To categorize the types of agricultural wastes.
- To outline the production and utilization of biomass.
- To explain the various parameters considered to be important in the designing of biogas units.
- Todiscussthemethodsemployedintheproductionofalcoholfromagriculturalwastes/ byproducts.
- To summarize the overall aspects involved in the production of paper boards and particle boards from agricultural wastes

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Illustrate the collection and generation of value-added products from agricultural wastes	Knowledge
CO2	Demonstrate the techniques involved in the production and utilization of biomass.	Understand
CO3	Discuss the various parameters considered to be important in the designing of biogas units.	Create
CO4	Illustrate the various methods employed in the production of alcohol from the by products of agricultural wastes.	Knowledge
CO5	Discuss the appropriate material stop produce paper boards and particle boards from agricultural wastes.	Create

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I: TYPES OF AGRICULTURAL WASTES

Introduction and Background Agricultural Waste, Crop Waste, Agricultural Residues(annual crops),Technical terms, properties of agricultural waste- storage and handling - rice by-products utilization-rice bran and germ, rice bran oil, economic products from agriculture waste/by-products.

UNIT II: BIOMASS PRODUCTION AND UTILIZATION

Biomass – types – production and utilization Technology used for the utilization of agricultural wastes: Biomass Gasifier, Nimbkar Agricultural Research Institute(NARI) Gasifier,Rice-Husk Based Gasifier,Heat and Steam from Sugarcane Leaf and Bagasse.

UNIT III: BIOGAS DESIGN AND PRODUCTION

Biogas: Definition, composition, history of biogas, Production of biogas – factors affecting the efficiency; types of biogas plant (floating drum type and fixed dome type)and their components (inlet, outlet, stirrer, slanting pipe, digester, gas holder and gas outer pipe), Selection and Design of biogas plant.

UNIT IV: PRODUCTION OF ALCOHOL FROM WASTE MATERIALS

Production of Alcohol from waste materials: Introduction, Production methods, Cellulolysis (biological approach): Pretreatment, Cellulolytic processes (Chemical and Enzymatic hydrolysis), Microbial fermentation, Gasification process (thermo chemical approach).

UNITV: PRODUCTION OF PAPER BOARD AND PARTICLE BOARDS FROM AGRICULTURAL WASTE

Biodegradable packing materials: merits and demerits, Production and testing of Paper boards and Particle boards from Agricultural Waste: Introduction, History, Terminology and classification,
Raw materials, Production steps-Pulping, Classifications of pulp, Bleaching, Plies, Coating, Grades.

Suggested Readings

1 Navanietha Krishnaraj Rathinam, RajeshSani. Biovalorisation of Wastes to Renewable Chemicals and Biofuels. Elsevier,1st Edition, 2019. (ISBN:9780128179529)., 2019. (ISBN:9780128179529).
2 Efthymia Alexopoulou.Bio energy and Biomass from Industrial Crops on Marginal Lands. Elsevier,1st Edition, 2020.(ISBN:9780128188644).
3 Simona Ciuta,DemetraTsiamis,MarcoJ.Castaldi.Gasification of Waste Materials. Academic Press, 1st Edition, 2017.(ISBN:9780128127162).
4 Nicholas E.Korres, Padraig O'Kiely, John A.H.Benzie,Jonathan S.West. Bioenergy Production by Anaerobic Digestion: Using Agricultural Biomass and Organic Wastes. Routledge,1st Edition,2013.(ISBN-13:9780415698405).
5 Albert Howard, Yashwant Wad. The Waste Products of Agriculture. Benediction Classics, 1st Edition, 2011. (ISBN-13:9781849025).

RENEWABLE ENERGY RESOURCES

Course Objectives

- To gain the knowledge about environmental aspects of energy utilization.
- To understand the basic principles of solar cells, photovoltaic conversion.
- To understand the basic principles of wind energy conversion.
- To gain the knowledge about hydro and ocean energy.
- To understand the basic principles of Biomass, fuel cell, Geo thermal power plants and MHD.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Discuss remedies/potential solutions to the supply and environmental issues associated with fossil fuels and other energy resources.	Apply
CO2	Selection, Operation and Operation of Solar PV System for different types of applications	Apply
CO3	Selection and Operation of Wind Turbine system	Understand
CO4	Selection and Operation of Hydroelectric Plant and Ocean Energy	Understand
CO5	Biomass Power Generation Types, Applicability and Limitations, Selection and Operation of Fuel Cell, Geo thermal plants and MHD	Understand

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I : INTRODUCTION

Energy scenario - Different types of Renewable Energy Sources - Environmental aspects of energy utilization-Energy Conservation and Energy Efficiency- Needs and Advantages, Energy Conservation Act 2003.

UNIT II: SOLARENERGY

Introduction to solar energy: solar radiation, availability, measurement and estimation–Solar thermal conversion devices and storage – solar cells and photovoltaic conversion –PV systems – MPPT. Applications of PV Systems– solar energy collectors and storage.

UNIT III: WINDENERGY

Introduction– Basic principles of wind energy conversion-components of wind energy conversion system - site selection consideration – basic–Types of wind machines. Schemes for electric generation – generator control, load control, energy storage – applications of wind energy – Interconnected systems.

UNIT IV: HYDROENERGY

Hydropower,classificationofhydropower,Turbineselection,Oceanenergyresources,oceanenergy routes. Principles of ocean thermal energy conversion systems, ocean thermal power plants. Principles of ocean wave energy conversion and tidal energy conversion.

UNIT V: OTHER SOURCES

Bio energy and types –Fuel cell, Geo-thermal power plants; Magneto-hydro-dynamic(MHD) energy conversion.

Suggested Readings

1   Rai.G.D,Non-conventionalsourcesofenergyKhannapublishers,2011
2   Khan.B.H,Non-Conventional Energy Resources ,TheMcGraw Hills, Second edition,2012
3   John W Twidell and Anthony D Weir , Renewable Energy Resources , Taylor and Francis – 3rd edition ,2015
4   Fundamentals and Applications of Renewable Energy | Indian Edition, by Mehmet Kanoglu, Yunus A. Cengel, John M. Cimbala, cGraw Hill; First edition (10 December 2020), ISBN-10 : 9390385636.