B.Sc. COMPUTER TECHNOLOGY

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 TECHNOLOGY

FACULTY OF ARTS, SCIENCE, COMMERCE AND MANAGEMENT

KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed to be University)

(Established Under Section 3 of UGC Act, 1956)

(Accredited with A+ Grade by NAAC in the Second Cycle)
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FACULTY OF ARTS, SCIENCE, COMMERCE AND MANAGEMENT

UNDER – GRADUATE PROGRAMMES

(REGULAR PROGRAMME)

REGULATIONS
(2023)

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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.	Artificial Intelligence and Data Science	Fundamentals of Artificial Intelligence
		Fundamentals Of Data Science
		Internet Programming
		Robotics And Automation
6.	Biomedical Engineering	Human Anatomy and Physiology
		Artificial Organs and Implants
7.	Bio Technology	Bioreactor Design
		Food Processing and Preservation
		Basic Bioinformatics

		Fundamentals Of Nano Biotechnology
8.	Civil Engineering	Housing, Plan and Management
		Building Services
		Repair and rehabilitation of structures
		Computer-Aided Civil Engineering Drawing
		Contracts Management
		Air and Noise Pollution andControl
9.	Computer Science and Design	Introduction To 3d Modelling and Animation
		Digital photography
		Mobile Application Development
10.	Computer Science and Engineering	Internet of Things
		Machine Learning
		Blockchain Technologies
11.	Electronics and Communication Engineering	Neural Networks and Its Applications
		Principles of Modern Communication System
12.	Food Technology	Processing Of Food Materials
		Nutrition And Dietetics
		Ready To eat foods
		Agricultural Waste And Byproducts Utilization
		Design Of Food process equipment
13.	Mechanical Engineering	Computer Aided Design
		Industrial Safety and Environment
		Non-Destructive testing
14.	Electrical and Electronics Engineering	Electric Hybrid Vehicle
		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.

14.3.5 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.

GPA of a Semester = (Sum of the product of the GP by the corresponding credits of the courses offered in that Semester) / (Sum of the credits of the courses of that Semester)

i.e. **GPA** of a Semester = $\frac{\sum_i CiGPi}{\sum_i Ci}$

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

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

where,

Ci is the credit fixed for the course 'i' in any semester
GPi is the grade point obtained for the course 'i' in any semester
'n' refers to the Semester in which such courses are credited.

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

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 3^{rd} or 5^{th} or 7^{th} 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,**	

Annexure I

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

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

15.	B. Com	International Accounting and Finance	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern Commerce as a subject under the academic or vocational stream at the Higher Secondary level
16.	B.Com	Information Technology	Candidates who have passed Higher Secondary Education (XII) or any equivalent Examination conducted by a State Government or a University or Board under the 10+2 pattern Commerce as a subject under the academic or vocational stream at the Higher Secondary level

PROGRAMME 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, and 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 and 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

PROGRAMME 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, IoT, Image processing, web designing, Artificial Intelligence and networking for efficient design of computer-based system of varying complexity.

l) Apply standard software Engineering practices and strategies in software project development using open-source programming environment to deliver a quality for business success.

m) Be acquainted with the contemporary issues, latest trends in technological development and thereby innovate new ideas and solutions to existing 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 Computer Technology (CT) professional with core competencies that can be used on multi-disciplinary projects

PEO II : To understand the importance of relationship building within the IT industry

PEO III : To understand the need for lifelong learning in the exploration and journey in CT

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		c	d	e	f	g	h	i	j	k	l	m	
PEO I	X	X	X				X	X	X	X	X		X	
PEO II	X	X	X				X	X	X	X				X
PEO III	X	X	X				X	X					X	
PEO IV				X	X	X			X					X
PEO V	X	X	X				X	X		X			X	

DEPARTMENT OF COMPUTER TECHNOLOGY
FACULTY OF ARTS, SCIENCE, COMMERCE AND MANAGEMENT
UG PROGRAM (CBCS) – B.Sc. Computer Technology
(2023–2024 Batch and onwards)

Course code	Name of the course	Objectives and out comes		Instruction hours / week			Credit(s)	Maximum Marks			Category	Page No
		PEOs	POs	L	T	P		CIA	ESE	Total		
								40	60	100		
SEMESTER – I												
23LSU101	Language - I	IV	e.f	4	-	-	4	40	60	100	AEC 1	1
23ENU101	English - I	II	d,i	3	-	-	3	40	60	100	MDC 1	6
23CTU101	Programming in C	I	a,b, c	5	-	-	5	40	60	100	Major 1	8
23CTU102	Numerical Methods	III	g,h	4	-	-	3	40	60	100	Min 1	10
23CTU111	Programming in C – Practical	I	a,b, c	-	-	4	2	40	60	100	Major 2	13
23SEC101	Office Automation - Practical	IV	c,d	-	-	6	3	40	60	100	SEC 1	16
23VAC101	Value Added Course - Environmental Studies	II	d,e	2	-	-	2	40	60	100	VAC1	20
	Activity / Library / Seminar			2	-	-	-	-	-	-	-	
Semester Total				**20**	**0**	**10**	**22**	**280**	**420**	**700**		
SEMESTER – II												
23LSU201	Language – II	IV	e.f	4	-	-	4	40	60	100	AEC2	23
23ENU201	English - II	II	d,i	3	-	-	3	40	60	100	MDC 2	27
23CTU201	Object Oriented Programming	III	a,b	5	-	-	5	40	60	100	Major 3	30
23CTU202	Discrete Structures	I	a,b, c	4	-	-	3	40	60	100	Min 2	33
23CTU211	Object Oriented Programming – Practical	III	a,b	-	-	4	2	40	60	100	Major 4	35
23SEC201	Web Programming – Practical	IV	c,d, e	-	-	6	3	40	60	100	SEC 2	37
23VAC201	Value Added Course - Indian Knowledge System	V	e	2	-	-	2	40	60	100	VAC 2	40
	Activity / Library / Seminar			2	-	-	-	-	-	-	-	
Semester Total				**20**	**0**	**10**	**22**	**280**	**420**	**700**		

SEMESTER – III												
23LSU301	Language – III	IV	e.f	4	-	-	4	40	60	100	AEC3	42
23ENU201	English - III	II	d,i	3	-	-	3	40	60	100	MDC 3	45
23CTU301	Relational Database Management System	III	a,b	5	-	-	5	40	60	100	Major 5	47
23CTU302	Data Structures	IV	c,d	4	-	-	4	40	60	100	Major 6	49
23CTU303	Operation Research	III	a,b	4	-	-	3	40	60	100	Min 3	51
23CTU311	Relational Database Management System – Practical	III	a,b	-	-	3	1	40	60	100	Major 7	53
23CTU312	Data Structures - Practical	IV	c,d	-	-	3	1	40	60	100	Major 8	55
23VAC301	Value added Course- Health & Wellness	II	e	2	-	-	2	40	60	100	VAC 3	57
23ITU391	Internship*	IV		-	-	-	2	-	-	100	Summer Internship	59
	Activity / Library / Seminar			2	-	-	-	-	-	-	-	
Semester Total				**24**	**0**	**6**	**25**	**320**	**480**	**900**		
SEMESTER – IV												
23LSU401	Language – IV	IV	e.f	4	-	-	4	40	60	100	AEC 4	60
23ENU401	English – IV	II	d,i	3	-	-	3	40	60	100	SEC 3	63
23CTU401	Programming in Python	III	a,h	4	-	-	4	40	60	100	Major 9	65
23CTU402	Operating Systems	I	f	4	-	-	4	40	60	100	Major 10	68
23CTU403	Cyber Security	II	d,e	3	-	-	3	40	60	100	Major 11	70
23ITU404	Probability and Statistics	IV	h	4	-	-	3	40	60	100	Min 4	72
23CTU411	Programming in Python - Practical	III	a,h	-	-	3	1	40	60	100	Major 12	75
23CTU412	Operating Systems - Practical	I	f	-	-	3	1	40	60	100	Major 13	77
	Activity / Library / Seminar			2	-	-	-	-	-	-	-	
Semester Total				**24**	**0**	**6**	**23**	**320**	**480**	**800**		

SEMESTER –V												
23CTU501	Data Communication Networks	I	c,h	5	-	-	5	40	60	100	Major14	79
23CTU502A	PHP Programming	II	e,f	5	-	-	5	40	60	100	Major15	81/ 83
23CTU502B	.Net Programming	III	j,h									
23CTU503A	Soft Computing	II	a,i	4	-	-	4	40	60	100	Major16	85/ 87
23CTU503B	Cloud Computing	V	e,i									
23CTU504	Basics of Accounting	I	a,b,c	6	-	-	5	40	60	100	Min 5	89
23CTU511	Data Communication Networks	I	c,h	-	-	5	2	40	60	100	Major 17	91
23CTU512A	PHP Programming – Practical	II	e,f	-	-	5	2	40	60	100	Major18	93/ 96
23CTU512B	.Net Programming – Practical	III	j,h									
23CTU591	Internship*			-	-	-	2			100		98
	Semester Total			**20**	**0**	**10**	**25**	**240**	**360**	**700**		
SEMESTER –VI												
23CTU601	Artificial Intelligence	II	d,e	6	-	-	6	40	60	100	Major19	98
23CTU602A	Data Science using R Programming	I	c,h	6	-	-	6	40	60	100	Major 20	101 / 104
23CTU602B	Big Data Analytics	I	b,c									
23CTU603	Entrepreneurship	III	a,b	6	-	-	5	40	60	100	Min 6	107
23CTU611	Artificial Intelligence – Practical	I	c,h	-	-	4	2	40	60	100	Major 21	109
23CTU691	Project					8	4	40	60	100	Major 22	111
	Semester Total			**18**	**0**	**12**	**23**	**200**	**300**	**500**		
	Grand Total			**126**	**0**	**54**	**140**	**1640**	**2460**	**4300**		
SEMESTER –VII												
23CTU701	J2EE	I	b,c,g	6	-	-	6	40	60	100	Major 23	112
23CTU702	Data Visualization	I	b,c,g	6	-	-	6	40	60	100	Major 24	114
23CTU703	Statistical Computing	I	b,c,g	6	-	-	6	40	60	100	Minor 7	116
23CTU711	J2EE – Practical	III	h,j	-	-	6	3	40	60	100	Major 25	118
23CTU712	Data Visualization – Practical	I	b,c,g	-	-	6	3	40	60	100	Major 26	120
	Semester Total			18	**0**	**12**	**24**	**200**	**300**	**500**		
SEMESTER -VIII -A												
23CTU801	MongoDB	I	b,c,g	6	-	-	5	40	60	100	Major 27	122
23CTU802	Internet of Things	I	b,c,g	6	-	-	5	40	60	100	Major 28	124
23CTU803	Organizational Behavior	I	b,c,g	6	-	-	4	40	60	100	Minor 8	126
23CTU811	MongoDB - Practical	I	b,c,g	-	-	6	3	40	60	100	Major 29	128
23CTU812	Internet of Things – Practical	I	b,c,g	-	-	6	3	40	60	100	Major 30	131

	Semester Total			**18**	**0**	**12**	**20**	**200**	**300**	**500**		
	SEMESTER -VIII -B											
23CTU801	Research Methodology and IPR	I	b,c,g	6	-	-	4	40	60	100	Major31	133
23CTU811	SPSS – Practical	I	b,c,g	-	-	6	4	40	60	100	Minor 8	136
23CTU891	Research Project/Preparation of Research Project	I	b,c,g		-	18	12	100	200	300	Major32	138
	Semester Total			**6**	**0**	**24**	**20**	**180**	**320**	**500**		
	Grand Total			**162**	**0**	**78**	**184**	**2040**	**3060**	**5300**		

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

Major		
Semester	**Course Code**	**Name of the Course**
I	23CTU101	Programming in C
	23CTU111	Programming in C – Practical
II	23CTU201	Object Oriented Programming
	23CTU211	Object Oriented Programming – Practical
III	23CTU301	Relational Database Management System
	23CTU302	Data Structures
	23CTU311	Relational Database Management System – Practical
	23CTU312	Data Structures – Practical
IV	23CTU401	Programming in Python
	23CTU402	Operating Systems
	23CTU403	Cyber Security
	23CTU411	Programming in Python – Practical
	23CTU412	Operating Systems – Practical
V	23CTU501	Data Communication Networks
	23CTU502A	PHP Programming
	23CTU502B	.Net Programming
	23CTU503A	Soft Computing
	23CTU503B	Cloud Computing
	23CTU511	Data Communication Networks – Practical
	23CTU512A	PHP Programming – Practical
	23CTU512B	.Net Programming – Practical
VI	23CTU601	Artificial Intelligence
	23CTU602A	Data Science Using R Programming
	23CTU602B	Big Data Analytics
	23CTU611	Artificial Intelligence – Practical
	23CTU691	Project
VII	23CTU701	J2EE
	23CTU702	Data Visualization
	23CTU711	J2EE – Practical

	23CTU712	Data Visualization – Practical
VIII A	23CTU801	MongoDB
	23CTU802	Internet of Things
	23CTU811	MongoDB – Practical
	23CTU812	Internet of Things - Practical
VIII B	23CTU801	Research Methodology and IPR
	23CTU891	Research Project/ Preparation of Research Project

Minor		
Semester	**Course Code**	**Name of the Course**
I	23CTU102	Numerical Methods
II	23CTU202	Discrete Structures
III	23CTU303	Operation Research
IV	23CTU404	Probability and Statistics
V	23CTU504	Basics of Accounting
VI	23CTU603	Entrepreneurship
VII	23CTU703	Statistical Computing
VIII A	23CTU803	Organizational Behaviour
VIII B	23CTU811	SPSS-Practical

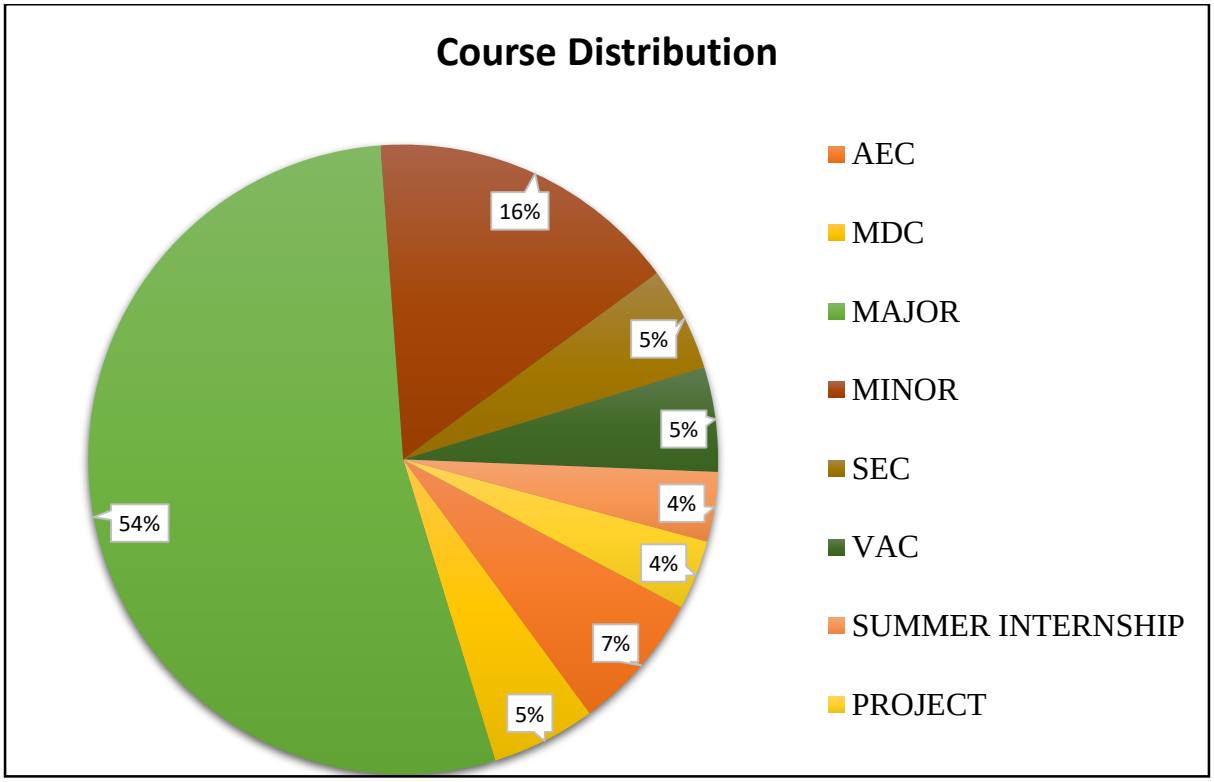
Skill Enhancement Courses (SEC)		
Semester	**Course Code**	**Name of the Course**
I	23SEC101	Office Automation – Practical
II	23SEC201	Web Programming – Practical
IV	23ENU401	English – IV

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

Summer Internship		
Semester	**Course Code**	**Name of the Course**
III	23CTU391	Internship*
V	23CTU591	Internship*

Course Distribution Table

Category	No of Courses		Total
	Theory	Practical	
AEC	4	0	4
MDC	3	0	3
MAJOR	17	13	30
MINOR	8	1	9
SEC	1	2	3
VAC	3	0	3
PROJECT	0	2	2
Total	36	18	54



SEMESTER-I
LANGUAGE - I

4H-4C

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

இலக்கிய இன்பம்

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 இடம்பெறுகின்ற, 'தமிழ்இலக்கியவரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
- கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வு மனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
- தமிழின் வளர்ச்சித்துறையாகிய, 'அறிவியல்தமிழ்' ; 'இணையதமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச்சிந்தனை மேம்பாடு.
- வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
- 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	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

தாள்கள் வரிசையும் தேர்வுச் செயல் திட்டமும்
பகுதி-I தமிழ்

பருவம்	தாள்	கற்பிக்கும் நேரம்/வாரம்	தேர்வு மணிகள்	மதிப்பெண் அக/எழுத்து	மொத்தம்	மதிப்பீடு
ஒன்று	I	4	3	40 / 60	100	4

இளநிலைப்பட்ட அறிவியல் வகுப்புகள்
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- வையத்துள்வாழ்வாங்கு

அன்புடைமை - 80 - அன்பின்வழியது, **விருந்தோம்பல் -** 90 – மோப்பக்குழையும்,

இனியவைகூறல் - 95 – பணிவுடையன் இன்சொலன்,

செய்நன்றி அறிதல் - 103 – பயன் தூக்கார்,

புறங்கூறாமை - 190 – ஏதிலார் குற்றம், **ஒப்புரவுஅறிதல் -** 216 – பயன்மரம்

ஈகை: 228 – ஈத்துவக்கும் இன்பம், **துறவற இயல் - தவம் -** 261 – உற்றநோய்

வாய்மை - 291 – வாய்மை எனப்படுவது, **வெகுளாமை -** 306 - சினமென்னும்

இன்னாசெய்யாமை : 316-இன்னா எனத்தான் உணர்ந்தவை

நிலையாமை - 331 – நில்லாதவற்றை, **ஊழியல் - ஊழ் -** 373 – நுண்ணியநூல்

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

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

காப்பியம் - சிலப்பதிகாரம்:

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

மனையறம்படுத்த காதை - 'வார்ஒலிகூந்தலை' – 'சிறப்பின் கண்ணகிதனக்குஎன்' (84-90)

அரங்கேற்று காதை -‘மாமலர்நெடுங்கண்’ - ‘அகம்மறந்து’ (170-175).
மதுரைக்காண்டம் - கொலைக்களக்காதை, ‘இருமுதுகுரவர்’ - ‘எழுந்தனன்யான்’ (67-83),‘வினைவிளைகாலம்’ - ‘ கொணர்கஈங்குஎன’ (148-153)
கட்டுரை காதை - ‘கடிபொழில்’ - ‘இல்சாபம்பட்டனிர்’ (138-170)
வழக்குரைக் காதை - ‘அல்லவை செய்தார்க்கு’ - ‘தோற்றான்உயிர்’ (82-93)
வஞ்சிக் காண்டம் - நடுகல்காதை - ‘மதுரைமூதூர்’ - ‘மன்னவர்ஏறு’ (218-234)
வாழ்த்துக் காதை - ‘என்னேஇஃது’ - ‘தோன்றுமால்’ (9)
எழுத்திலக்கணம் - முதல் மற்றும் சார்பெழுத்துகள்

அலகு- 2 (10 மணிநேரம்)

சங்க இலக்கியம் – பத்துப்பாட்டு அறிமுகம்
சங்க இலக்கியம் - பதிற்றுப்பத்து : ஏழாம்பத்து- எறிபிணம் இடறிய செம்மறுக்– 65
சங்க இலக்கியம் - கலித்தொகை : அகன்ஞாலம் விளக்கும் - நெய்தல்கலி – தலைவிகூற்று- 119.
அற இலக்கியம் -முன்றுறையரையனார் - பழமொழி நானூறு 5 பாடல்கள்
காப்பியம் -மணிமேகலை : விழாவறைகாதை : ‘தேவரும் மக்களும்’ - ‘மருங்குஎன்’ (66-72)
ஊரலர் உரைத்தகாதை : ‘நாவல்ஓங்கிய’ - ‘உண்டுகொல்’(1-17), ‘கற்றுத்துறைபோகிய’ – ‘தீத்தொழில்படாஅள்’ (32-57).
பாத்திரம் பெற்றகாதை : ‘போதிநீழல்’ - ‘நல்அறம்கண்டனை’ (73-98)
சிறைக்கோட்டம் அறக்கோட்டம் ஆக்கியகாதை -‘வாழிஎம்கோ’ - ‘அரசுஆள்வேந்துஎன்’
(129-163)
சொல்இலக்கணம் - பெயர், வினை, இடை, உரிச்சொல்- விளக்கமும்பயிற்சியும்

அலகு– 3 (10 மணிநேரம்)

அறஇலக்கியங்கள் அறிமுகம்
சங்க இலக்கியம் - பரிபாடல்: வையை : பாடல்-6. - நிறைகடல் முகந்து உராய் – சேறுஆடுபுனலதுசெலவு 1-50.
சங்க இலக்கியம் -அகநானூறு - ஈன்று புறம்தந்த எம்மும் உள்ளாள் – பாலை– நற்றாய்கூற்று-35
அற இலக்கியம் -ஔவையார்- கொன்றை வேந்தன் (1-50 பாடல்கள்**)**
காப்பியம் - சூளாமணி–அரசியல்சருக்கம்- 1. நாவியே கமழும்(1131), 2. கண்மிசை கனிந்த (1132),3. விரைசெலலிவுளித்(1133), 4. அரைசர்கள் வருக (1134), 5. அருளுமாறடிகள் (1135), 6. விஞ்சையருலக (1136), 7. சொரிகதிர் (1137), 8. கரியவன் வளைந்த(1138), 9. மடித்தவா யெயிறு (1139),10. விஞ்சயரதனைக் (1140), **துறவுச்சருக்கம்** – பயாபதி மன்னனின் துறவுநெறி -1. மன்னிய புகழி(1840), 2. திருமகிழலங்கன் (1841) , 3. ஆங்கவ

ரணைந்த (1842), 4. அலகுடன் விளங்கு (1843), 5. தன்னையோர் அரசனாக்கி (1844), 6. சென்றநாள்(1845), 7. எரிபுரை (1846.), 8. பிறந்தனர்(1847), 9. பிறந்தநாம் (1848), 10. தொகைமலர் (1849) 11. ஒழுகிய(1850).

பொருள் இலக்கணம் - அகத்திணை மற்றும் புறத்திணை இலக்கணங்கள்.

அலகு- 4 (10 மணிநேரம்)

சிற்றிலக்கியங்கள் தோற்றமும் வளர்ச்சியும்

சங்க இலக்கியம் - ஐங்குறுநூறு : தாய்சாப்பிறக்கும் – தோழிகூற்று – மருதம் - களவன்பத்து: 24

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

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

சின்னவோர் பொருள், கடவுளை வருத்தி, எப்புவிகளும், வைத்தவர், ஈன்றவர்

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

கடிதப்பயிற்சி

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

அலகு – 5 (8 மணிநேரம்)

காப்பியங்கள் - தோற்றமும் வளர்ச்சியும்

சங்க இலக்கியம் - பத்துப்பாட்டு: சிறுபாணாற்றுப்படை

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

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

அற இலக்கியம் – குமரகுருபரர் - நீதி நெறி விளக்கம்

(தேர்ந்தெடுக்கப்பட்ட 5 பாடல்கள் மட்டும்)

உறுதி பயப்ப, முயலாது வைத்து, உலையாமுயற்சி, காலம் அறிந்து, மெய்வருத்தம்

கடிதப்பயிற்சி

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

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

வினாத்தாள் கட்டமைப்பு

இடைத்தேர்வு வினாத்தாள்

மொத்த மதிப்பெண்கள் 50

பகுதி – அ (ஒரு மதிப்பெண் வினாக்கள்) 20 X 1 = 20 (சரியான விடையினைத் தேர்ந்தெடுத்தெழுதுதல்)
பகுதி – ஆ (இரு மதிப்பெண் வினாக்கள்) 3 X 2 = 6 (அனைத்து வினாக்களுக்கும் விடையளித்தல்)
பகுதி – இ (ஆறுமதிப்பெண் வினாக்கள்) 6 X 4 =24 (அனைத்து வினாக்களுக்கும் விடையளித்தல்)

பருவத்தேர்வு வினாத்தாள் - மொத்த மதிப்பெண்கள் 60

பகுதி – அ (ஒரு மதிப்பெண் வினாக்கள்) 20 X 1 = 20 (சரியான விடையினைத் தேர்ந்தெடுத்தெழுதுதல்)
பகுதி – ஆ (இரு மதிப்பெண் வினாக்கள்) 5 X 2 = 10 (அனைத்து வினாக்களுக்கும் விடையளித்தல்)
பகுதி – இ (ஆறுமதிப்பெண் வினாக்கள்) 5 X 6 =30 (அல்லது வகையில் தேர்ந்தெடுத்து எழுதுதல்)

23ENU101

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:3 Hours

Course Objectives

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

Course Outcomes

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

COs	Course Outcomes	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 Wiiliam Blake
GRAMMAR: Subject and Predicate – Question Tags

UNIT V **8 Hours**

LISTENING: Listening Strategeis
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

Websites	
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: L: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.
- Ton 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	Apply

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT -I Overview of C **12 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 **12 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 **12 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
3	https://www.learn-c.org/
4	https://www.includehelp.com/articles/top-5-websites-for-learning-c-programming-language.aspx
5	https://www.codechef.com/c-programming

SEMESTER-I

NUMERICAL METHODS

4H-3C

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

Course Objectives (CO)

- To 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	M	M
CO3	S	S	L	L	L	M	L	M	M	M	M	M
CO4	S	S	L	L	M	L	M	M	M	L	M	M

CO5	S	S	L	L	M	L	M	M	L	L	M	M

S-Strong; M-Medium; L-Low

UNIT I **9 HOURS**

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

UNIT II **9 HOURS**

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

UNIT III **9 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 **12 HOURS**

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

Suggested Readings	
1	Kandasamy P., Dr. Thilagavathy K., and Dr.Gunavathi K.,(2013). Numerical Methods, Published By S.Chand & Company Pvt. Ltd., New Delhi.
2	Jain M.K., Iyengar S.R.K., and Jain R.K . (2012). Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, New Delhi.
3	Veerarajan T., and Ramachandran T., (2008). Numerical Methods with Programs in C, Tata McGraw-Hill Publishing company limited, New Delhi
4	Bradie B.,(2007) .A Friendly Introduction to Numerical Analysis, Pearson Education, India.

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

23CTU111

SEMESTER-I

PROGRAMMING IN C - PRACTICAL

4H-2C

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

End Semester Exam:3 Hours

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.
- 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	S	M	L	M	S	M	S	L	M	S
CO2	S	M	S	M	M	L	S	L	M	L	M	L
CO3	M	S	M	L	L	L	S	M	S	M	M	M
CO4	S	S	S	L	L	M	S	M	M	M	S	M
CO5	M	S	S	M	L	L	S	M	S	M	S	M

S-Strong; M-Medium; L-Low

PROGRAMS

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

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

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/

23SEC101

SEMESTER-I

OFFICE AUTOMATION - PRACTICAL

6H-3C

Instruction Hours/week: L:0 T:0 P: 6 **Marks:** Internal**:40** External**:60 T**otal**:100**

End Semester Exam:3 Hours

Course Objectives

- To Perform documentation.
- To Perform accounting operation.
- To Perform presentation skill.
- To Study concepts of Libre office, Spreadsheets, Presentation Tools.
- To Demonstrate the ability to apply application software in an office environment.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Understand the dynamics of an office environment.	Understand
CO2	Understand the basics of computer systems and its components.	Understand
CO3	Understand and create a presentation using PowerPoint tool.	Understand
CO4	Understand and apply the basic concepts of electronic spreadsheet software	Understand
CO5	Analysis file mangers, word processors, spreadsheets, presentation software's.	Analysis

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

PROGRAMS (MS Word)

1. Create a news-paper document with at least 200 words,
   i. Use margins as, top:1.5, bottom:2, left:2, right:1 inches.
   ii. Use heading "Gandhi Jayanti", font size: 16, font color: red, font face: Arial Black.
   iii. With first letter "dropped" (use drop cap option) of the first paragraph containing a picture at the right side
   iv. Use three columns from the second paragraph onwards till the half of the page.
   v. Then use heading "Computer basics"
   vi. Create paragraph using two columns till the end of the page.

2. Create a Mathematical question paper using, at least five equations
   i. With fractions, exponents, summation function
   ii. With at least one „m*n‟ matrix
   iii. Basic mathematical and geometric operators.
   iv. Use proper text formatting, page color and page border.
3. Create a flowchart using,
   i. Proper shapes like ellipse, arrows, rectangle, and parallelogram.
   ii. Use grouping to group all the parts of the flowchart into one single object.
4. Create a table using table menu with,
   i. At least 5 columns and 10 rows.
   ii. Merge the first row into one cell.
   iii. Merge the second row into one cell, then split the second row into three cells.
   iv. Use proper table border and color.
   v. Insert proper content into the table with proper text formatting.
5. Create a table using two columns,
   i. The left column contains all the short-cut keys and right-side column contains the function of the short-cut keys.
   ii. Insert a left column using layout option. Name the heading as Serial No.
6. Create two letters with the following conditions in Ms Word and find the difference.
   i. Write a personal letter to your friend using at least 100 words and two paragraphs. The date must be in top-right corner. Use "justify" text- alignment and 1.5 line spacing for the body of the letter. Letter must contain proper salutation and closing.
   ii. Use step by step mail-merge wizard to design a letter.
7. Create a letter, which must be sent to multiple recipients.
   i. Use Mail-Merge to create the recipient list.
   ii. Use excel sheet to enter the recipient.
   iii. Start the mail merge using letter and directory format. State the difference.

PROGRAMS (MS Excel)

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

2 Do as directed
   i. Create a notepad file as per the following fields
   Slno name th1 th2 th3 th4 th5 total % grade

3 Import this notepad file into excel sheet using data from text option.

4 Grade is calculated as,

i. If %>=90, then grade A
ii. If %>=80 and <90, then grade B
iii. If %>=70 and <80, then grade C
iv. If %>=60 and <70, then grade D
v. If %<60, then grade F

5 Create a sales table using the following data,

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

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

PROGRAMS (MS Power Point)

1. Create a power-point presentation with minimum 5 slides.
   i. The first slide must contain the topic of the presentation and name of the presentation.
   ii. Must contain at least one table.
   iii. Must contain at least 5 bullets, 5 numbers.
   iv. The heading must be, font size:32, font-face: Arial Rounded MT Bold, font-color: blue.
   v. The body must be, font size: 24, font-face: Comic Sans MS, font-color: green.
   vi. Last slide must contain „thank you".
2. Create a power-point presentation with minimum 10 slides
   i. Use word art to write the heading for each slide.
   ii. Insert at least one clip-art, one picture
   iii. Insert at least one audio and one video
   iv. Hide at least two slides
3. Create a power-point presentation with minimum 5 slides
   i. Use custom animation option to animate the text; the text must move left to right one line at a time.
   ii. Use proper transition for the slides.

PROGRAMS (MS Access)

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

2. With addition to the table above,
   i. Add an additional field "result" to the "mark sheet" table.

ii. Enter data for at least 10 students
iii. Calculate the result for all the students using update queries, if total>=200, then pass, else fail.
iv. Search the students, whose name starts with “sh”.
v. Show the names and total marks of the students who have passed the examination.

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

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

SEMESTER-I

VALUE ADDED COURSE – ENVIRONMENTAL STUDIES

2H-2C

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

Course Objectives (CO)

- To create the 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 understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
- To apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
- To reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

Course Outcomes (COs)

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

COs	Course Outcomes	Blooms Level
CO1	Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.	Understand
CO2	Master core concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.	Understand
CO3	Appreciate 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.	Analysis
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 5 Hours

Environment Definition, Scope and importance; Ecosystem, Structure and functions of ecosystem. Energy flow, Food chains and food webs, Ecological succession. Classification of ecosystem. 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 and land use change, Land degradation, soil erosion and desertification. Forest resources - Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. Water resources - Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water. Use of alternate energy sources, growing energy needs, case studies. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

Unit III - Biodiversity and its Conservation 5 Hours

Levels of biological diversity - genetic, species and ecosystem diversity. Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value. Bio-geographical classification of India. Biodiversity patterns (global, National and local levels). Hot-spots of biodiversity. India as a mega-diversity nation. Endangered and endemic species of India. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

Unit IV - Environmental Pollution 4 Hours

Definition, causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution. Nuclear hazards and human health risks. Solid waste management and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Case studies.

Unit V - Social Issues and the Environment 5 Hours

Concept of sustainability and sustainable development. Water conservation - Rain water harvesting, watershed management. 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). International agreements (Montreal and Kyoto protocols).Resettlement and rehabilitation of project affected persons. Disaster management (floods, earthquake, cyclones and landslides). Environmental Movements (Chipko, Silent valley, Bishnois of Rajasthan). Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi). Human population growth: Impacts on environment, human health and welfare.

Suggested Readings	
1	Rajagopalan, R. 2016. Environmental Studies: From Crisis to Cure, Oxford University Press**.**
2	Sing, J.S., Sing. S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand & Publishing Company, New Delhi.
3	Mishra, D.D. 2010. Fundamental Concepts in Environmental Studies. S. Chand & Company Pvt. Ltd., New Delhi.
4	Anonymous. 2004. A text book for Environmental Studies, University Grants Commission and Bharat Vidypeeth Institute of Environmental Education Research, New Delhi.
5	Anubha Kaushik., and Kaushik, C.P. 2004. Perspectives in Environmental Studies. New Age International Pvt. Ltd. Publications, New Delhi.
6	Arvind Kumar. 2004. A Textbook of Environmental Science. APH Publishing Corporation, New Delhi.
7	Daniel, B. Botkin., and Edward, A. Keller. 1995. Environmental Science John Wiley and Sons, Inc., New York.
8	Odum, E.P., Odum, H.T. and Andrews, J. 1971. Fundamentals of Ecology. Philadelphia: Saunders.
9	Singh, M.P., Singh, B.S., and Soma, S. Dey. 2004. Conservation of Biodiversity and Natural Resources.Daya Publishing House, New Delhi.
10	Tripathy. S.N., and Sunakar Panda. (2004). Fundamentals of Environmental Studies (2nd ed.). Vrianda Publications Private Ltd, New Delhi.
11	Verma, P.S., and Agarwal V.K. 2001. Environmental Biology (Principles of Ecology). S. Chand and Company Ltd, New Delhi.
12	Uberoi, N.K. 2005. Environmental Studies. Excel Books Publications, New Delhi.

SEMESTER-II
LANGUAGE - II

4H-4C

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

End Semester Exam:3 Hours

மொழிகள்துறை - தமிழ்ப்பிரிவு
பகுதி - I தமிழ்ப் பாடத்திட்டம் (2023 - 2024)
இரண்டாம் பருவம் -பகுதி – I, தமிழ், தாள் II - 23LSU201 4 - H, 4 - C
(இளநிலை அறிவியல்பட்ட வகுப்புகளுக்குரியது)

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, 'தமிழ்இலக்கியவரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
- கல்வெட்டியல், ஓலைச் சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வு மனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
- தமிழின் வளர்ச்சித் துறையாகிய, 'அறிவியல்தமிழ்' '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

தாள்கள் வரிசையும் தேர்வுச் செயல்திட்டமும்

பகுதி- I தமிழ்

இளநிலைஅறிவியல்பட்டவகுப்புகள்

பருவம்	தாள்	கற்பிக்கும் நேரம்/வாரம்	தேர்வு மணிகள்	மதிப்பெண் அக/எழுத்து	மொத்தம்	மதிப்பீடு
இரண்டு	II	4	3	40 / 60	100	4

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 மாதஇதழிலிருந்து

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

அலகு - 3 **(10 மணிநேரம்)**

புதுக்கவிதை **-** தோற்றமும் வளர்ச்சியும்

சிற்றிலக்கியம் **-**தோற்றமும்வளர்ச்சியும்

மதுரைசொக்கநாதர் - தமிழ்விடுதூது - தமிழின் சிறப்பு பாடியருள பத்துப்பாட்டும் - விளம்பக்கேள்.

கவிதை- ஈரோடுதமிழன்பன் - இன்னொரு சுதந்திரம்

சிறுகதை - கு. அழகிரிசாமி **-** இருவர் கண்ட ஒரேகனவு

கட்டுரை - ஔவைதுரைசாமி **-** ஏட்டில் இல்லாத இலக்கியம்

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

அலகு – 4 **(10 மணிநேரம்)**

சிறுகதை - தோற்றமும் வளர்ச்சியும்

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

அருள்தரும் பூங்கோதையன்னை அந்தாதி - 11பாடல்கள்

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

கவிதை - கவிஞர்தாமரை - தொலைந்துபோனேன்

சிறுகதை - அம்பை - 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**

வினாத்தாள் கட்டமைப்பு

இடைத்தேர்வு வினாத்தாள்

மொத்த மதிப்பெண்கள் 50

பகுதி - அ (ஒரு மதிப்பெண் வினாக்கள்) 20 X 1 = 20 (சரியான விடையினைத் தேர்ந்தெடுத்தெழுதுதல்)

பகுதி - ஆ (இரு மதிப்பெண் வினாக்கள்) 3 X 2 = 6 (அனைத்து வினாக்களுக்கும் விடையளித்தல்)

பகுதி - இ (ஆறுமதிப்பெண் வினாக்கள்) 6 X 4 =24 (அனைத்து வினாக்களுக்கும் விடையளித்தல்)

பருவத்தேர்வு வினாத்தாள் - மொத்த மதிப்பெண்கள் 60

பகுதி - அ (ஒரு மதிப்பெண் வினாக்கள்) 20 X 1 = 20 (சரியான விடையினைத் தேர்ந்தெடுத்தெழுதுதல்)

பகுதி - ஆ (இரு மதிப்பெண் வினாக்கள்) 5 X 2 = 10 (அனைத்து வினாக்களுக்கும் விடையளித்தல்)

பகுதி - இ (ஆறுமதிப்பெண் வினாக்கள்) 5 X 6 =30 (அல்லது வகையில் தேர்ந்தெடுத்து எழுதுதல்)

SEMESTER-II

ENGLISH - II

3H-3C

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

End Semester Exam:3 Hours

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 **6 HOURS**

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

UNIT- II **6 HOURS**

Listening **:** Listening for Pleasure (Story)
Speaking **:** Oral presentation
Reading **:** Reading Passages
Writing : Essay writing
Literature **:** Prose: Dimensions of Creativity by A.P.J. Abdul Kalam
Grammar **:** Subject, verb, agreement

UNIT-III **6 HOURS**

Listening **:** Dictation
Speaking **:** Public speaking and secrets of good delivery
Reading : Note Making
Writing **:** Writing agendas, memos and minutes
Literature **:** River by A.K. Ramanujan
Grammar **:** Degrees of comparison

UNIT- IV **6 HOURS**

Listening **:** Listening to instructions and announcements
Speaking **:** Debating
Reading **:** Silent reading and methods of reading
Writing **:** Writing Notices
Literature **:** Two Gentlemen of Verona by A.J. Cronin
Grammar **:** Phrases and clauses

UNIT-V **6 HOURS**

Listening **:** Testing listening
Speaking **:** Situational Conversation
Reading **:** Developing reading activities
Writing **:** E - Mail Writing
Literature **:** The Postmaster by Rabindranath Tagore
Grammar **:** Direct and indirect speech

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S.NO	Books for References
1	Oxford Handbook of Writing: St. Martins Handbook of Writing 2013 Cambridge University Press.
2	Sound Business, Julian Treasure 2012Oxford University Press.
3	Hornby, A,S.(1975) The Guide to patterns and usage in English: oxford university Press.

SEMESTER-II

OBJECT ORIENTED PROGRAMMING

5H-5C

Instruction Hours/week: L: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.
- The student will learn to transpose the physical problem domain into a hierarchy of objects.
- Industry standard software engineering techniques will be presented and used to architect the system design.
- Objects, their behaviors, and their relationships, will be modeled and these models will be programmed into a functional application that the student will compile, modify, enhance and run.
- The student will program in a structured style whereby reinforcing the concepts of software quality, reliability and maintainability.

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.	Apply
CO4	Apply pointer concepts in C++	Analysis
CO5	Understand how to manage console I/O operations.	Understand
CO6	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**	**M**	**M**	**L**	**L**	**L**	**M**	**S**	**M**	**S**	**M**
CO2	**S**	**M**	**S**	**L**	**L**	**M**	**M**	**L**	**S**	**M**	**S**	**M**
CO3	**S**	**M**	**M**	**M**	**L**	**L**	**L**	**M**	**M**	**M**	**M**	**M**
CO4	**M**	**S**	**M**	**M**	**L**	**L**	**M**	**M**	**M**	**L**	**M**	**L**
CO5	**M**	**S**	**M**	**L**	**L**	**L**	**M**	**L**	**L**	**L**	**S**	**L**

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: **10 Hours**

Template Functions and Template Classes - Streams: Stream Classes – Formatted and Unformatted Data – Manipulators – User Defined Manipulators – File Streams – File Pointer Manipulation – Sequential File Access- Random File Access- 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	Harry, H. Chaudhary, 2014. Head First C++ Programming: The Definitive Beginner's Guide, First Create space Inc, O-D Publishing, LLC USA.

Websites	
1	www.programmingsimplified.com
2	https://nptel.ac.in/courses/106/105/106105171
3	www.programiz.com / cpp -programming
4	www.cplusplus.com
5	https://nptel.ac.in/courses/106101208/

SEMESTER-II

DISCRETE STRUCTURES

4H-3C

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

Course Objectives (CO)

- To 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**	**S**
CO2	S	S	**S**	**L**	M	**M**	S	M	S	M	**M**	**S**
CO3	S	S	**S**	**L**	L	**M**	S	M	S	M	**S**	**S**
CO4	S	S	**S**	**S**	L	**M**	S	S	S	S	**S**	**S**
CO5	S	S	**S**	**S**	M	**M**	S	S	S	S	**M**	**S**

S-Strong; M-Medium; L-Low

UNIT I **8 HOURS**

Prepositional Logic: Prepositions - Truth tables - Logical Connectives - Well formed Formulas

-Demorgan's Law - Tautologies and Contradictions - PDNF and PCNF – Equivalences - Inference Theory - Rules of universal specification and generalization.

UNIT II **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: Pigeonhole 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 HamiltonianPaths and Circuits -Trees - Basic Terminology and Properties of Trees.

Suggested Readings	
1	Kenneth Rosen., (2019). Discrete Mathematics and Its Applications (8th ed.), 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

BACHELOR OF COMPUTER TECHNOLOGY

23CTU211 **2023-2024**

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	M	S	M	M	L	L	L	M	S	M	S	M
CO2	S	M	S	L	L	M	M	L	S	M	S	M
CO3	S	M	M	M	L	L	L	M	M	M	M	M
CO4	M	S	M	M	L	L	M	M	M	L	M	L
CO5	M	S	M	L	L	L	M	L	L	L	S	L

S-Strong; M-Medium; L-Low

PROGRAMS

1. Write a C++ program to print sum of digits.
2. Write a C++ program to check palindrome number.
3. Write a program to swap numbers using friend function.
4. Write a program to perform multiplication of two matrices using operator
5. overloading.
6. Write a program that will read 10 integers from user and store them in an array. Implement array using pointers.
7. 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.
8. 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).
9. Write a program to demonstrate the try, catch block in C++
10. Write a C program to count the number of lines, words and characters in a given text.
11. 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

23SEC201

SEMESTER-II

WEB PROGRAMMING - 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 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 develop the ability to logically plan and develop web pages

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

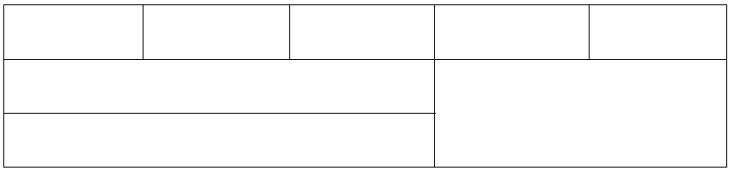
Mapping with Programme Outcomes

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

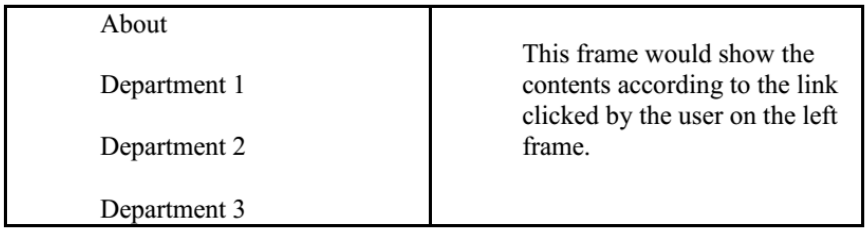
S-Strong; M-Medium; L-Low

PROGRAMS

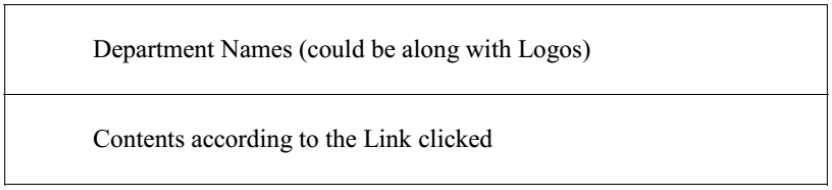
1. To create a web page using following formatting – Bold, Italics, Underline, Colors, Headings, Title, Font and Font Width, Background, Paragraph, Line Breaks, Horizontal Line, Blinking text as well as marquee text.
2. To create a web page using Ordered Lists, Unordered Lists, Inserting images, Internal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



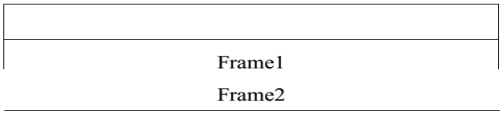
4. To create a web page using input type, select and Text Area in HTML.
5. To create a HTML Form containing Roll No, name of the student and Grades in a tabular form.
6. To create a web page using Frames in HTML.

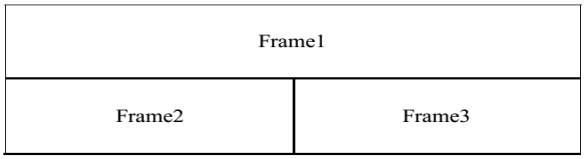


7. To create a web page using Horizontal Frames in HTML.



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 web page using External Style Sheet.
    a. Text Box
    b. Option/radio buttons
    c. Check boxes
    d. Reset and Submit buttons

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

11. To write JavaScript program to compute squares and cubes of numbers from 5 to 15.
12. To write JavaScript program to find the largest of three numbers.
13. To write JavaScript program to find the factorial of a number.
14. To write JavaScript program to calculate sum and average of numbers.

15. To write JavaScript program to count the number of negative numbers, positive numbers and zeros in the list.
16. To write JavaScript program to prompt username and display it.

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

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

VALUE ADDED COURSE – INDIAN KNOWLEDGE SYSTEM

2H-2C

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

End Semester Exam:3 Hours

COURSE OBJECTIVES:

- 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 **(4 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 **(4 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 **(4 Hours)**

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 **(4 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 **(4 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.

S.NO	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.

S.NO	WEBSITES
1	https://iks.iitgn.ac.in/wp-content/uploads/2016/01/Indian-Knowledge-Systems-Kapil-Kapoor.pdf
2	https://www.sanskritimagazine.com/india/traditional-knowledge-systems-of-india/

SEMESTER - III
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

பாடத்திட்ட பயன் விளைவு

1. வரலாற்றிற்கு முற்பட்ட தமிழகத்தை மாணவர்களுக்கு அறிமுகப்படுத்துதல்
2. பழந்தமிழர் பண்பாடு சார்ந்த வாழ்க்கை முறையை மாணவர்கள் அறிய ஊக்குவித்தல்
3. தமிழ்மொழியின் பழைமையும், திராவிட மொழிகளில் தமிழ்மொழியின்
   தனிச்சிறப்பையும் மாணவர்களுக்கு அறிமுகப்படுத்துதல்.
4. தமிழர்களின் வாழ்வியல், தமிழர் கலைகள், ஆற்றங்கரைப் பண்பாடுகள் குறித்து
   மாணவர்கள் அறியச் செய்தல்.
5. இந்தியக் 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 பன்நோக்கு அணுகுமுறையிலான ஆய்வுச்சிந்தனை மேம்பாடு.
4. வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
5. சமுதாய மற்றும் வாழ்வியல் மதிப்புகளைப் பேணுவதற்குக் கருவியாக இலக்கியங்களை நாடுகின்ற மனப்பான்மை வளர்ச்சி. மொழிபெயர்ப்புத் 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

தாள்கள் வரிசையும் தேர்வுச் செயல் திட்டமும்
பகுதி-I தமிழ்
இளநிலை கலைத்துறைப் பட்ட வகுப்புகளுக்குரியது

பருவம்	தாள்	கற்பிக்கும் நேரம்/வாரம்	தேர்வுமணிகள்	மதிப்பெண் அக/எழுத்து	மொத்தம்	மதிப்பீடு
மூன்று	3	4	3	40 / 60	100	4

அலகு:1 சங்க இலக்கியம் (9 மணிநேரம்)

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

அலகு: 2 அற இலக்கியமும் காப்பியமும் (10 மணிநேரம்)

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

அலகு:3 திருமுறைகளும் திவ்யப்பிரபந்தமும் (9 மணிநேரம்)

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

அலகு: 4 சிற்றிலக்கியங்களும் இக்கால இலக்கியங்களும் (10 மணிநேரம்)

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

அலகு: 5 தமிழின் ஐந்திலக்கணம் (10 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:

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

இணையதளம்

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

இதழ்கள்

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

வினாத்தாள் கட்டமைப்பு

இடைத்தேர்வு வினாத்தாள்

மொத்த மதிப்பெண்கள் 50

பகுதி - அ (ஒரு மதிப்பெண் வினாக்கள்) 20 X 1 = 20 (சரியான விடையினைத் தேர்ந்தெடுத்தெழுதுதல்)

பகுதி - ஆ (இரு மதிப்பெண் வினாக்கள்) 3 X 2 = 6 (அனைத்து வினாக்களுக்கும் விடையளித்தல்)

பகுதி - இ (ஆறுமதிப்பெண் வினாக்கள்) 6 X 4 =24 (அனைத்து வினாக்களுக்கும் விடையளித்தல்)

பருவத்தேர்வு வினாத்தாள் - மொத்த மதிப்பெண்கள் 60

பகுதி - அ (ஒரு மதிப்பெண் வினாக்கள்) 20 X 1 = 20 (சரியான விடையினைத் தேர்ந்தெடுத்தெழுதுதல்)

பகுதி - ஆ (இரு மதிப்பெண் வினாக்கள்) 5 X 2 = 10 (அனைத்து வினாக்களுக்கும் விடையளித்தல்)

பகுதி - இ (ஆறுமதிப்பெண் வினாக்கள்) 5 X 6 =30 (அல்லது வகையில் தேர்ந்தெடுத்து எழுதுதல்)

SEMESTER-III
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 **7 HOURS**

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

UNIT- II **8 HOURS**

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

UNIT-III **7 HOURS**

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

UNIT- IV **7 HOURS**

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

UNIT-V **7 HOURS**

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

S.NO	Books for References
1	Krashen, Stephen D (1982) Principles and practice in second language acquisition. NewYork: Pergamon Press.
2	Oxford Handbook of Writing: St. Martins Handbook of Writing 2013 Cambridge Universiity Press.
3	Wren & Martin, 2008, *High School English Grammar & Composition*, S.Chand & Company Ltd, Board of Editors,

23CTU301

SEMESTER-III

RELATIONAL DATABASE MANAGEMENT SYSTEM

5H-5C

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

End Semester Exam:3 Hours

Course Objectives

- Understand the basic concepts and the applications of database systems.
- Master the basics of SQL and construct queries using SQL.
- Understand the relational database design principles.
- Familiar with the basic issues of transaction processing and concurrency control.
- Familiar with database storage structures and access techniques.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	outline the necessity of database along with various Data models	Understanding
CO2	express the ways to work with combined table using relational model	Applying
CO3	Applying normalization techniques and organize the order of storing data	Analyzing
CO4	Demonstrate their understanding of key notions of query evaluation and optimization techniques.	Apply
CO5	Extend normalization for the development of application software‘s.	Apply

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT - I INTRODUCTION AND DATABASE DESIGN MODEL 12 Hours

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

UNIT - II INTRODUCTION TO SQL **12 Hours**

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

UNIT - III RELATIONAL DATABASE DESIGN **12 Hours**

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

UNIT - IV INTERMEDIATE AND PL/ SQL **12 Hours**

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

UNIT - V TRANSACTIONS AND CONCURRENCY CONTROL **12 Hours**

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

Suggested Readings	
1	Silberschatz Abraham, Korth Henry F., and Sudarshan S, "Database System Concepts", 6 Edition, McGraw Hill Education, India, 2018.
2	Elmasri Ramez, Navathe Shamkant B, "Fundamentals of Database Systems", 7 Edition, Pearson Education, 2016.
3	Ramakrishnan Raghu, Gehrke Johannes, "Database Management Systems", 3 Edition, McGraw Hill Education,2014
4	Database Systems using Oracle, Nilesh Shah, 2nd edition, PHI.
5	C.J.Date - An introduction to Database Systems, Seventh Edition

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

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**	**M**	**M**	**L**	**L**	**M**	**M**	**M**	**M**	**S**	**M**
CO2	**M**	**M**	**M**	**L**	**L**	**L**	**M**	**M**	**M**	**M**	**M**	**M**
CO3	**M**	**M**	**M**	**L**	**L**	**L**	**S**	**M**	**M**	**L**	**M**	**M**
CO4	**S**	**S**	**M**	**L**	**L**	**L**	**S**	**S**	**M**	**L**	**S**	**L**
CO5	**S**	**S**	**S**	**L**	**L**	**L**	**S**	**S**	**M**	**M**	**M**	**M**

S-Strong; M-Medium; L-Low

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 **9 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 **9 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 **10 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

OPERATION RESEARCH

4H-3C

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

Course Objectives

- To learn the basic concepts and applications of linear programming and to impart knowledge in concepts and tools of Operations Research.
- To know the constructive techniques to make effective business decisions
- 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	M	S	M	L	M	S	S	L	M	M	M
CO2	M	S	S	M	M	M	S	S	L	M	S	M
CO3	S	S	S	S	M	L	S	M	S	M	M	M
CO4	S	M	S	M	S	S	M	S	S	S	M	M
CO5	M	S	S	L	M	L	M	M	M	M	M	M

S-Strong; M-Medium; L-Low

Unit I **9 HOURS**

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

Unit – II **10 HOURS**

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

Unit- III **10 HOURS**

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

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

Unit – IV **9 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.

S.NO	Suggested Readings
1	Kandiswarup, P. K. Gupta and Man Mohan. (2011). Operations Research, 12th Revisededition, S. Chand & Sons Education Publications, New Delhi.
2	Sharma S.D.,(2017). Operations Research Theory, Methods & Applications, Kedar NathRam Nath Publications, India.
3	Hamdy A. Taha . (2012). Operations Research-An Introduction, Nineth edition, published byDorling Kindersley (India) Pvt. Ltd., licensees of Pearson Education in South Asia.
4	Prem Kumar Gupta and Hira D.S.,(2014). Operations Research , S. Chand & CompanyLtd, Ram Nagar, New Delhi.
5	Srinivasan G., (2017). Operations Research: Principles and Applications, PHI, New Delhi

S.NO	Websites
1	https://youtu.be/vUMGvpsb8dc
2	https://youtu.be/ItOuvM2KmD4

SEMESTER-III

RELATIONAL DATABASE MANAGEMENT SYSTEM - 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 describe a sound introduction to the discipline of database management systems.
- To give a good formal foundation on the relational model of data and usage of Relational Algebra.
- To introduce the concepts of basic SQL as a universal Database language.
- To enhance knowledge to advanced SQL topics like embedded SQL, procedures connectivity through JDBC.
- To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	write basic SQL queries for database manipulations	Understanding
CO2	make use of the complex queries using SQL	Applying
CO3	develop SQL and PL/SQL commands to create and manipulate databases	Applying
CO4	manipulate database using PL/SQL functions and procedures.	Analyzing
CO5	solve real world problems using SQL and PL/SQL	Applying

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS

1. Basic SQL SELECT Statements – Creating and managing tables using DDL, DML, Integrity constraints.
2. DCL, TCL and DB Object (View, Sequence, Index, Synonym, Alias) commands
3. Single row Functions (character, mathematical and date functions) and Aggregate functions
4. Displaying Data from Multiple Tables using SQL operators, GROUPBY, HAVING and ORDERBY clause and also perform join operation.
5. Write a program to perform Basic PL/SQL programs
6. Write a PL/SQL program to find the total and average of 6 subjects and display the grade.
7. Write a PL/SQL block that handles exceptions.
8. Write SQL Triggers for insert, delete, and update operations in a database table.
9. Write the PL/SQL programs to Create the procedure for palindrome of given number
10. Write the PL/SQL programs to create the recursive function for factorial of given number

Suggested Readings	
1	Silberschatz Abraham, Korth Henry F., and Sudarshan S, "Database System Concepts", 6th Edition, McGraw Hill Education, India, 2018.
2	Elmasri Ramez, Navathe Shamkant B, "Fundamentals of Database Systems", 7th Edition, Pearson Education, 2016.
3	Ramakrishnan Raghu, Gehrke Johannes, "Database Management Systems", 3rd Edition, McGraw Hill Education,2014
4	Database Systems using Oracle, Nilesh Shah, 2nd edition, PHI.
5	C. J. Date - An introduction to Database Systems, 7th Edition

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

SEMESTER-III

DATA STRUCTURES - 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 teach efficient storage mechanisms of data for an easy access.
- To design and implementation of various basic and advanced data structures.
- To introduce various techniques for representation of the data in the real world.
- To develop application using data structures.
- To teach the concept of protection and management of data.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Implement linear data structures and use it to solve the given problem	Understanding
CO2	Make use of linear data structures concepts to solve the problems on non linear data structures	Applying
CO3	Implement the operations of trees	Applying
CO4	Implement searching, sorting and indexing operations	Analyzing
CO5	Apply appropriate graph algorithms for solving computing problems.	Applying

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS

1. Develop a program to perform various stack operations using an array.
2. Implement a Program using Queue Data Structures.
3. Infix to postfix conversion using stack ADT
4. Construct a binary search Tree for a given number of elements.
5. Implementation of singly linked list and its operations
6. Write a program to perform Linear Search.

7. Sort the number of elements using insertion sort.
8. Arrange the given number of elements using selection sort method.
9. Write a program to perform Graph Traversals.
10. Implement the following operations in hash table using array
    i. Store the element in hash table
    ii. Search an element from the table
    iii. Delete an element from the table

Suggested Readings	
1	Weiss M. A., "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 2016
2	Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, "Introduction to Algorithms", 3rd Edition, Mcgraw Hill, 2009
3	Langsam Y.M., Augenstein J. and Tenenbaum A. M., "Data Structures using C and C++", 2nd Edition, Pearson Education, 1996.
4	Anany Levitin, "Introduction to the Design and Analysis of Algorithms", 3rd Edition, Pearson Education, 2012
5	Vijayalakshmi Pai G.A, "Data Structures and Algorithms – Concepts, Techniques and Applications", 1st Edition, McGraw Hill Education, New Delhi, 2017

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

SEMESTER-III

VALUE ADDED COURSE – HEALTH & WELLNESS

2H-2C

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

Course Objective:

- 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, psycosocial 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: **4 HOURS**

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

S.NO	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

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SEMESTER-III

INTERNSHIP

0H-2C

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

SEMESTER-IV
LANGUAGE - IV

4H-4C

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

பாடத்திட்ட பயன் விளைவு

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

பாடத்திட்டப் பொது நோக்கம்

6. இந்தியக் குடியுரிமைப்பணி முதலான போட்டித் தேர்வுகளில், விருப்பப்பாடமாக இடம்பெறுகின்ற, 'தமிழ்இலக்கியவரலாறு' குறித்த முழுமையான அறிமுகம் பெற்றிருத்தல்.
7. கல்வெட்டியல், ஓலைச்சுவடியியல் மற்றும் தொல்லியல் சார்ந்த ஆவணத் தேடலுக்குரிய ஆய்வு மனப்பான்மையுடன், இலக்கியங்களை அணுகுதல்.
8. தமிழின் வளர்ச்சித்துறையாகிய, 'அறிவியல்தமிழ்' ; 'இணையதமிழ்' குறித்த பன்நோக்கு அணுகுமுறையிலான ஆய்வுச்சிந்தனை மேம்பாடு.
9. வேலைவாய்ப்புக்குரிய சுயதிறன் மேம்பாட்டுடன், படைப்பாக்கத்திறன் மேம்பாடும் பெற்றிருத்தல் .
10. 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

தாள்கள் வரிசையும் தேர்வுச் செயல் திட்டமும்
பகுதி-I தமிழ்

பருவம்	தாள்	கற்பிக்கும் நேரம்/வாரம்	தேர்வுமணிகள்	மதிப்பெண் அக/எழுத்து	மொத்தம்	மதிப்பீடு
நான்கு	4	4	3	40 / 60	100	4

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

ENGLISH - IV

3H-3C

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

Course Objectives

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

Course Outcomes

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

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

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
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

S.NO	Suggested Readings:
1	Oxford Handbook of Writing: St. Martins Handbook of Writing 2013 Cambridge University Press
2	Wren & Martin, 2008, *High School English Grammar & Composition*, S.Chand & Company Ltd, Board of Editors,
3	Krashen, Stephen D (1982) Principles and practice in second language acquisition. New York: Pergamon Press.

SEMESTER-IV

PROGRAMMING IN PYTHON

4H-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 provide Basic knowledge of Python
- To learn how to design and program Python applications.
- To learn how to use lists, tuples, and dictionaries in Python programs.
- To Understand file operation and database creations.
- To provide knowledge about python packages and GUI programming.

Course Outcomes

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

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

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I OVERVIEW OF PROGRAMMING AND INTRODUCTION TO PYTHON **8 Hours**

Overview of Programming : Structure of a Python Program, Elements of Python. Introduction to Python: Python Interpreter, Using Python as calculator, Python shell, Indentation. Atoms, Identifiers and keywords, Literals, Strings, Operators(Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator).

UNIT II CREATING PYTHON PROGRAMS **8 Hours**

Creating Python Programs: Input and Output Statements, Control statements (Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass.), Defining Functions, default arguments, Errors and Exceptions.

UNIT III PYTHON COMPLEX DATA TYPES **8 Hours**

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

UNIT IV PYTHON FILE OPERATIONS **8 Hours**

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

UNIT V PYTHON PACKAGES AND OBJECTS AND CLASSES **8 Hours**

Python packages: Simple programs using the built-in functions of packages matplotlib, numpy, pandas etc. GUI Programming: Tkinter introduction, Tkinter and Python Programming, Tk Widgets, Tkinter examples. Python programming with IDE. Objects and Classes: Define a Class with class – Inheritance – Override a Method – Add a Method – Get Help from Parent with super – In self Defense – Get and Set Attribute Values with Properties – Name Mangling for Privacy – Method Types – Duck Typing – Special Methods –Composition.

Suggested Readings	
1	Allen Downey, Jeffrey Elkner, Chris Meyers.How to think like a computer scientist learning with Python / 1st Edition,2012
2	Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning, ISBN: 978- 1111822705
3	Wesley J. Chun, “Core Python Applications Programming”, 3rd Edition , Pearson Education, 2016
4	Charles Dierbach, “Introduction to Computer Science using Python”, Wiley, 2015
5	Jeeva Jose & P.SojanLal, “Introduction to Computing and Problem Solving with PYTHON”, Khanna Publishers, New Delhi, 2016
6	Bill Lubanovic, “Introducing Python”, O’Reilly, First Edition-Second Release, 2014
7	Mark Lutz, “Learning Python”, O’Reilly, Fifth Edition, 2013.

Websites	
1	http://docs.python.org/3/tutorial/index.html
2	http://interactivepython.org/courselib/static/ pythons
3	http://www.ibiblio.org/g2swap/byteofpython/read/
4	https://www.netacad.com/courses/networking/ccna-switching-routing-wireless-essentials
5	http://spoken-tutorial.org/

SEMESTER-IV

OPERATING SYSTEMS

4H-4C

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

End Semester Exam:3 Hours

Course Objectives

- To understand basic concepts of Operating System, its functions and services.
- To familiarize the management functions of Operating System.
- To acquire knowledge about basic concepts of mass storage structure
- To acquire knowledge in Linux Operating System.
- To enrich the knowledge about OS like Unix , Linux and Windows XP is introduced as case study

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Ability to understand about basic concepts of Operating System, its functions and services.	Understand
CO2	Understanding about Process Management, CPU scheduling, File handling and I/O operations.	Apply
CO3	Ability to understand about memory management	Analyze
CO4	Understanding about of mass storage structure	Apply
CO5	Acquiring basic knowledge about OS like Linux and Windows 10	Analyze

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I Introduction **8 Hours**

Introduction-Defining Operating System-Computer-System Organization- ComputerSystem Organization- ComputerSystem Architecture- Operating- System Structure- Operating System Operations- Process Management- Memory Management- Storage ManagementProtection and Security- Kernel Data Structures- Computing Environments- Open-Source Operating Systems.

UNIT II Processes Management **8 Hours**

Processes Management: Process Concept- Process Scheduling- Operations on ProcessesInterprocess Communication- Examples of IPC Systems- Communication in Client–Server Systems.

Deadlocks: System Model- Deadlock Characterization- Methods for Handling DeadlocksDeadlock Prevention- Deadlock Avoidance- Deadlock Detection- Recovery from Deadlock.

UNIT III Main Memory **8 Hours**

Main Memory: Background- Swapping- Contiguous Memory Allocation- Segmentation- PagingStructure of the Page Table.

Virtual Memory: Background- Demand Paging- Page Replacement- Allocation of Frames - Thrashing- Memory Mapped Files- Allocating Kernel Memory.

UNIT IV Mass Storage Structure **8 Hours**

Mass Storage Structure: Overview of Mass-Storage Structure- Disk Structure- Disk AttachmentDisk Scheduling- Disk Management- Swap-Space Management- RAID Structure- Stable-Storage Implementation.

File –System Interface: File Concept- Access Methods- Directory and Disk Structure- File-System Mounting- File Sharing- Protection.

UNIT V The Linux System **8 Hours**

The Linux System: Linux History- Design Principles- Kernel Modules- Process ManagementScheduling- Memory Management- File Systems- Input and Output- Interprocess Communication- Network Structure- Security.

Windows 10 : History- Design Principles- System Components- Terminal Services and Fast User Switching- File System- Networking- Programmer Interface.

Suggested Readings	
1	Silberschatz, Galvin Gagne, Operating System Concepts, 9th Edition, Wiley India Edition,2013
2	DeitelDeitelChoffnes, Operating Systems, 3rd Edition, Pearson Education, 2003.
3	Stuart E. Madnick, John J.Donovan. Operating Systems, 3rd Edition, Tata McGraw Hill,2003.
4	"Modern Operating Systems" by Andrew S. Tanenbaum
5	"Operating System Principles" by Galvin, Abraham Silberschatz, and Greg Gagne
6.	"The Linux Programming Interface: A Linux and UNIX System Programming Handbook" by Michael Kerrisk

Websites	
1	http://spoken-tutorial.org/
2	https://www.studocu.com/
3	https://infinite.education/view/ZCbZM02MLnA8KcU3ElWRaAre

23CTU403

SEMESTER-IV

CYBER SECURITY

3H-3C

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

End Semester Exam:3 Hours

Course Objectives

- To understand of the basic Mathematical tools for cryptography concepts.
- To learn the concept of AES, Blowfish algorithm and its applications.
- To recognize the concept of public key cryptosystems.
- To understand the concept of Digital Signature Algorithms
- To learn about Firewall and its applications.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Understanding basic Mathematical tools for cryptography concepts	Understand
CO2	Understanding the concept of AES, Blowfish algorithm and its applications	Understand & Apply
CO3	Analyzing the concept of public key cryptosystems.	Understand
CO4	Understanding the concept of Digital Signature Algorithms	Analyze
CO5	Understanding the concept of and Firewall and its applications	Understand & Apply

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I

Introduction and Data Encryption Standards **6 HOURS**

Introduction – Data Encryption Techniques– Substitution Ciphers – Transposition Ciphers – Steganography –Data Encryption Standards: Block ciphers, Block Cipher Modes of Operation– Feistel Ciphers – Data Encryption Stand - Triple DES – DES Design Criteria

UNIT II

Advanced Encryption Standard and Symmetric Ciphers 6 HOURS

Introduction, Advanced Encryption Standard – Overview of Rijndael – Advantages and Limitations of Rijndael, Comparison of AES with other ciphers – Blowfish Encryption Algorithm - RC5 – RC4– RC6 – Comparison Between RC6 and RC5.

UNIT III

Public Key Cryptosystems, Key Management and Authentication 6 HOURS

Introduction, Public key Cryptosystems – The RSA algorithm – Timing Attacks – Key Distribution, Diffie-Hellman Key Exchange – Elliptic Curve Arithmetic – Elliptic Curve Cryptography– Elliptic Curve Security and Efficiency, Zero Knowledge Proof – Authentication: Introduction, authentication methods – Message Digest – Kerberos – X.509 Authenticaiton Service.

UNIT IV

Digital Signatures, Electronic Mail Security and Web Security 6 HOURS

Introduction, Digital Signature Algorithms– Digital Signature Standards (DSS) – Authentication Protocols – Pretty Good Privacy (PGP) – S/MIME – MIME – History of S/MIME – Comparison PGP and S/MIME– Secure Socket Layer (SSL) – SSL session and connection – SSL Record Protocol – SSL in practice – Secure electronic Transactions.

UNIT V

Malicious Software and Firewall 6 HOURS

Malicious Code, viruses – Worms –Trojans – Spyware Best Practices – Digital Immune System – Attacks– Introduction, Packet Filters – Application-level gateways – Circuit level gateways – Firewall Architectures– Trusted System – Access Control.

Suggested Readings	
1.	V. K. Pachghare, Cryptography and Information Security, PHI. (Text BOOK)
2.	William Stalling, Cryptography and Network Security, 4th Edition, PHI
3.	Schneierand Bruce, Applied Cryptography: Protocols & Algorithms, 1st Edition, MGH.
Websites	
1.	https://www.csis.org/news/cybersecurity-agenda-45th-president
2.	https://cybersecuritystrategy.pmc.gov.au/assets/img/PMC-Cyber-Strategy.pdf
3.	https://www.javatpoint.com/cyber-security-tutorial

SEMESTER-IV

PROBABILITY AND STATISTICS

4H-3C

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

Course Objectives

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

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	To compute problems based on probability and conditional probability in appropriate ways.	Understand
CO2	To describe the probability distributions such as Binomial, Poisson and Normal distribution.	Understand & Apply
CO3	To evaluate various measures of descriptive statistical measures for any given data.	Understand
CO4	To derive the relationship between data using Correlation, Rank Correlation and Regressionfor two variables.	Analyze
CO5	To understand the basic concept of test of significance and make inferences from statisticaltests and also to develop an ability to analyze, demonstrate to provide meaningful information in fromthe 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	M	M
CO2	S	S	M	M	M	L	S	S	M	M	S	M
CO3	M	M	S	S	L	M	M	M	S	S	M	M
CO4	S	M	S	M	L	M	S	S	S	M	S	M
CO5	M	S	S	S	M	M	S	S	S	S	M	S

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. ConditionalProbability Bayes Rule.

Unit II : Discrete and Continuous Probability Distributions **8 HOURS**

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

Unit III : Basics of Statistics and Uni Variate Analysis **8 HOURS**

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

Unit IV: Bivariate Analysis **8 HOURS**

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

Unit V: Index Numbers **8 HOURS**

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

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

Websites	
1.	https://ocw.mit.edu/courses/mathematics/18-05-introduction-to-probability-and- statistics-spring-2014/
2.	https://www.youtube.com/watch?v=COI0BUmNHT8&list=PLyqSpQzTE6M_JcleDbrVyPnE0PixKs2JE
3.	https://nptel.ac.in/courses/110107114/
4	http://172.16.25.76/course/view.php?id=1642

23CTU411

SEMESTER-IV

PROGRAMMING IN PYTHON-PRACTICAL

3H-1C

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

End Semester Exam:3 Hours

Course Objectives

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

Course Outcomes

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

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

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

List of practicals

1. Expressions, conditionals, loops, list, dictionary, and strings.
2. Functions: scope, parameter passing.
3. Data objects, pass arrays to functions, return values .
4. Functions using libraries: mathematical, and string functions.
5. File handling: open and close a file, read, write,

6. File processing: append to a file, standard input, output, and error streams, relative and absolute paths.
7. Using Python libraries: create and import Python libraries
8. Recursion: simple algorithms with recursion: factorial, Fibonacci numbers;
9. Recursion on arrays: binary search .
10. Pandas: Importing package and Arrays .
11. Data visualization Pyplot: line chart, pie chart, and bar chart.
12. NumPy: Structured array and Sorting array.
13. Matplotlib: draw different charts for a data set.

Websites	
1	http://docs.python.org/3/tutorial/index.html
2	http://interactivepython.org/courselib/static/ pythons
3	http://www.ibiblio.org/g2swap/byteofpython/read/
4	https://www.netacad.com/courses/networking/ccna-switching-routing-wireless-essentials
5	http://spoken-tutorial.org/

23CTU412

SEMESTER-IV

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

Course Outcomes

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

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

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

Programme List

1. Basics of UNIX commands
2. Write programs using the following system calls of UNIX operating system fork, exec, getpid, exit, wait, close, stat, opendir, readdir
3. Write Simple programs using Shell
4. Write C programs to implement the various CPU Scheduling Algorithms
5. Write a C Program to Implementation of Semaphores
6. Write a C Program to Implementation of Shared memory and IPC
7. Write a C Program to implement the Bankers Algorithm for Deadlock Avoidance
8. Write a C Program to Implementation of Deadlock Detection Algorithm
9. Write a C Program to Implementation of the following Memory Allocation Methods for fixed partition
    a) First Fit b) Worst Fit c) Best Fit
10. Write a C Program to Implementation of Paging Technique of Memory Management
11. Write a C Program to Implementation of the following Page Replacement Algorithms
    a) FIFO b) LRU c) LFU
12. Write a C Program to Implementation of the following File Allocation Strategies
    a) Sequential b) Indexed c) Linked

Websites	
1	https://link.springer.com/book/
2	https://www.tutorialspoint.com/operating_system/index.htm
3	https://medium.com/javarevisited/6-best-operating-system-courses-for-beginners-to-learn
4	https://subjectguides.york.ac.uk/it-essentials/operating-systems
5	https://sadiapatkasite.wordpress.com/operating-system/os-practical-list-and-lab-manual/

BACHELOR OF COMPUTER TECHNOLOGY

23CTU501 **2023-2024**

SEMESTER-V

DATA COMMUNICATION NETWORKS

5H-5C

Instruction Hours/week: L:5 T:0 P:0 **Marks:** Internal**:40** External**:60 T**otal**: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.	Analyse
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	**M**	**S**	**M**		**L**			**S**	**M**			
CO2	**S**		**L**		**M**	**M**	**S**		**S**			
CO3		**M**		**S**								
CO4												
CO5				**S**		**S**						

Unit I -Introduction to Data Communication **12 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 – **12 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 **12 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 – Piggy backing.

Unit IV -Multiple Access Protocol **12 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 **12 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.

S.NO	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.

S.NO	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

BACHELOR OF COMPUTER TECHNOLOGY

23CTU502A **2023-2024**

SEMESTER-V

PHP PROGRAMMING **5H-5C**

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

End Semester Exam:3 Hours

Course Objectives (CO)

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

Course Outcomes

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

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

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I :INTRODUCTION TO PHP 12 **Hours**

PHP introduction, inventions and versions, important tools and software requirements (like Web Server, Database, Editors etc.) -PHP with other technologies, scope of PHP -Basic Syntax, PHP variables and constants -Types of data in PHP, Expressions, scopes of a variable (local, global)- PHP Operators: Arithmetic, Assignment, Relational, Logical operators, Bitwise, ternary and MOD operator

UNIT II: HANDLING HTML FORM WITH PHP **12 Hours**

PHP Form Introduction- Form Handling - Capturing Form Data-GET and POST form methods- Dealing with multi value fields Redirecting a form after submission - PHP Form Validation - Email, Name - PHP conditional events and Loops: PHP IF Else conditional statements (Nested IF and Else) -Switch case, while, For and Do While Loop -Goto, Break, Continue and exit.

UNIT III: PHP FUNCTIONS **12 Hours**

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

UNIT IV: STRING MANIPULATION AND REGULAR EXPRESSION **12 Hours**

Creating and accessing String, Searching & Replacing String -Formatting, joining and splitting String, String Related Library functions-Use and advantage of regular expression over inbuilt function -Use of preg_match(), preg_replace(), preg_split()-functions in regular expression

UNIT V: ARRAY **12 Hours**

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

Suggested Readings	
1	David Sklar, Adam Trachtenberg, 2019. PHP Cookbook: Solutions & Examples for PHP.
2	Robin Nixon, 2018. Learning PHP, MySQL, JavaScript, CSS & HTML5, (3rd ed.) Paperback, O'reilly.
3	Luke Welling, Laura Thompson, 2017. PHP and MySQL Web Development, (4th ed.), Addition Paperback, Addison-Wesley Professional.
4	Timothy Boronczyk, Martin E. Psinas, 2016. PHP and MYSQL (Create-Modify-Reuse), Wiley India Private Limited.
5	Steven Holzner, 2016. PHP: The Complete Reference Paperback, McGraw Hill Education (India).

Websites	
1	www.php.net/
2	en.wikipedia.org/wiki/PHP
3	www.w3schools.com/PHP/default.asp
4	http://www.nptelvideos.com/php/php_video_tutorials.php
5	http://172.16.25.76/course/view.php?id=1839

SEMESTER-V

. NET PROGRAMMING

5H-5C

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

End Semester Exam:3 Hours

Course Objectives

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

Course Outcomes

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

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

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I :INTRODUCTION TO .NET FRAMEWORK 12 Hours

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

UNIT II: VB .NET LANGUAGE 12 Hours

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

UNIT III:BASIC WINDOWS CONTROLS 12 Hours

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

UNIT IV: WORKING WITH FORMS 12 Hours

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

UNIT V: DATABASE PROGRAMMING WITH ADO .NET 12 Hours

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

Suggested Readings	
1	Evangelos Petroutsos, 2019. Mastering Visual Basic.Net, BPB Publications, New Delhi.
2	Ying Bai,2018. Practical Database Programming with Visual Basic.Net 2nd Edition, John Wiley & Sons Publication, Canada
3	Shirish Chavan. 2017. Visual Basic.Net, 1st Edition, Pearson Education, New Delhi.
4	Beginning Visual Basic 2016. Thearon Willis, Bryan Newsome, Wrox Publication, New Delhi,
5	VB.Net in Nutshell 2016. 2nd Edition. Steven Roman, Paul Lomax, Oreilly

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

SEMESTER-V
SOFT COMPUTING

4H-4C

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

Course Objectives

- To learn the basic concepts of Soft Computing
- To become familiar with various techniques like neural networks, genetic algorithms and fuzzy systems.
- To apply soft computing techniques to solve problems.
- To understand the basic operators in Genetic Algorithm.
- To be familiar with various soft computing tools in Fuzzy logic.

Course Outcomes

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

COs	**Course Outcomes**	**Blooms Level**
CO1	Will be able to differentiate Genetic Algorithm and Classification.	Analyze
CO2	Integrate various soft computing techniques for complex problems.	Understand
CO3	Apply suitable soft computing techniques for various applications.	Apply
CO4	Implement the Mutation operators in Genetic Algorithm.	Apply
CO5	Apply soft computing tools in Fuzzy logic compiler design.	Apply

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I INTRODUCTION TO SOFT COMPUTING 10 Hours

Introduction-Artificial Intelligence-Artificial Neural Networks-Fuzzy Systems-Genetic Algorithm and Evolutionary Programming-Swarm Intelligent Systems-Classification of ANNs-McCulloch and Pitts Neuron Model-Learning Rules: Hebbian and Delta- Perceptron Network-Adaline Network-Madaline Network.

UNIT II ARTIFICIAL NEURAL NETWORKS 10 Hours

Back propagation Neural Networks - Kohonen Neural Network -Learning Vector Quantization - Hamming Neural Network - Hopfield Neural Network- Bi-directional Associative Memory - Adaptive Resonance Theory Neural Networks- Support Vector Machines - Spike Neuron Models.

UNIT III FUZZY SYSTEMS 9 Hours

Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets - Classical Relations and Fuzzy Relations -Membership Functions -Defuzzification - Fuzzy Arithmetic and Fuzzy Measures - Fuzzy Rule Base and Approximate Reasoning - Introduction to Fuzzy Decision Making.

UNIT IV GENETIC ALGORITHMS 9 Hours

Basic Concepts- Working Principles -Encoding- Fitness Function - Reproduction - Inheritance Operators - Cross Over - Inversion and Deletion -Mutation Operator - Bit-wise Operators - Convergence of Genetic Algorithm.

UNIT VHYBRID SYSTEMS 10 Hours

Hybrid Systems -Neural Networks, Fuzzy Logic and Genetic -GA Based Weight Determination - LR-Type Fuzzy Numbers - Fuzzy Neuron - Fuzzy BP Architecture - Learning in Fuzzy BP-Inference by Fuzzy BP - Fuzzy ArtMap: A Brief Introduction - Soft Computing Tools - GA in Fuzzy Logic Controller Design - Fuzzy Logic Controller.

S.NO	SUGGESTED READINGS
1	N.P.Padhy, S.P.Simon, "Soft Computing with MATLAB Programming", Oxford University Press, 2015.
2	S.N.Sivanandam , S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt.Ltd., 2nd Edition, 2011.
3	S.Rajasekaran, G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications ", PHI Learning Pvt.Ltd., 2017.
4	Jyh-Shing Roger Jang, Chuen-Tsai Sun, EijiMizutani, ―Neuro-Fuzzy and Soft Computing‖, Prentice-Hall of India, 2002.
5	Kwang H.Lee, ―First course on Fuzzy Theory and Applications‖, Springer, 2005.
6	George J. Klir and Bo Yuan, ―Fuzzy Sets and Fuzzy Logic-Theory and Applications‖, Prentice Hall, 1996.

S.NO	web links
1	https://www.javatpoint.com/what-is-soft-computingwww.programiz.com / soft-computing
2	https://www.geeksforgeeks.org/need-for-soft-computing/
3	https://www.notesforgeeks.in/2021/08/cs8086-soft-computing-syllabus-2017-regulation.html

BACHELOR OF COMPUTER TECHNOLOGY **2023-2024**

23CTU503B

SEMESTER-V

CLOUD COMPUTING

4H-4C

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

End Semester Exam:3 Hours

Course Objectives

- Learn to identify the basic concepts, policies, and technologies of Cloud
- Learn to identify the impact of a Cloud architecture and Cloud Platforms.
- Learn the objectives of Cloud storage provides and applications.
- To be familiar with the concepts of cloud computing /performance issues in storage.
- To enable students exploring some important cloud computing driven commercial systems and applications.

Course Outcomes

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

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

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I **9 Hours**

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

UNIT II **9 Hours**

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

UNIT III **10 Hours**

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

UNIT IV **10 Hours**

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

UNIT V **10 Hours**

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

Suggested Readings	
1	**"Mastering Cloud Computing Foundations and Applications Programming"**, RajKumar Buyya, Christian Vecchiloa, S. Thamarai Selvi, TMH Publications, New Delhi, 2013.
2	**"Cloud Computing a Practical Approach"**, Velte Anthony and Velte T.J Elsenpeter, 1st Edition, 2010, Tata McGraw Hill Pvt Ltd, New Delhi.
3	**"Cloud Computing with the Windows Azure Platform"**, Lennings Roger, Wiley India Pvt. Ltd, 2010, New Delhi.
4	Cloud Computing: Concepts, Technology, and Architecture – By Zaigham Mahmood, Ricardo Puttini, and Thomas Erl.
5	Cloud computing, A practical Approach by toby velte, Anthony velte,Robert C, Elsenpeter @2009.

Websites	
1	http://docwiki.cisco.com/wiki/Introduction_to_cloud_Technologies
2	www.w3schools.com/cloud computing/default.asp
3	http://www.engppt.com/2009/12/cloud-computing-ppt-slides.html
4	http://citengg.blogspot.com/p/behrouz-forouzancloud computing.html
5	https://www.mheducation.co.in/cloud-computing-a-practical-approach

23CTU504

SEMESTER-V

BASICS OF ACCOUNTING

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 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	repare financial statements	Apply
CO4	Carry out depreciation on fixed assets	Apply
CO5	repare accounts for nonprofit organizations	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	M	M
CO2	S	S	M	M	M	L	S	S	M	M	S	M
CO3	M	M	S	S	L	M	M	M	S	S	M	M
CO4	S	M	S	M	L	M	S	S	S	M	S	M
CO5	M	S	S	S	M	M	S	S	S	S	M	S

S-Strong; M-Medium; L-Low

UNIT I 12 Hours

Accounting – Definition- Fundamentals of Book Keeping – Branches of Accounting – Nature of Accounts - Accounting Concepts and Conventions – Journal – Ledger.

UNIT II 12 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 12 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 12 Hours

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

UNIT V **12 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

S.NO	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.

23CTU511

SEMESTER-V

DATA COMMUNICATION NETWORKS – PRACTICAL

5H-2C

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

End Semester Exam:3 Hours

Course Objectives (CO)

- To study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model.
- To acquire knowledge of Application layer and Presentation layer paradigms and protocols.
- To study Session layer design issues, Transport layer services, and protocols.
- To gain core knowledge of Network layer routing protocols and IP addressing.
- To study data link layer concepts, design issues, and protocols.

Course Outcomes(COs)

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

COs	Course Outcomes	Blooms Level
CO1	Describe the functions of each layer in OSI and TCP/IP model.	Understand
CO2	Explain the functions of Application layer and Presentation layer paradigms and Protocols	Understand
CO3	Describe the Session layer design issues and Transport layer services.	Understand
CO4	Classify the routing protocols and analyse how to assign the IP addresses for the given network	Analyze
CO5	Describe the functions of data link layer and explain the protocols.	Understand

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

List of Programs

1. Simulate Cyclic Redundancy Check (CRC) error detection algorithm for noisy channel.
2. Simulate and implement stop and wait protocol for noisy channel.
3. Simulate and implement go back n sliding window protocol.
4. Simulate and implement selective repeat sliding window protocol.
5. Simulate and implement distance vector routing algorithm
6. Simulate and implement Dijkstra algorithm for shortest path routing.

S.NO	Suggested Readings
1	Forouzan,B. A. (2017). Data Communications and Networking (5th ed.).New Delhi: THM.
2	Tanenbaum, A. S. (2012). Computer Networks (5th ed.).New Delhi: PHI.
3	Wayne Tomasi (2007) Introduction to Data Communications and Networking (1st ed). Pearson
4	Alberto Leon-Garcia, Indra Widjaja (2017). Communication Network (2nd ed). Mc Graw Hill education.
5	Sathish Jain, Madhulika Jain, Vineeta Pillai, Kratika (2010). A Level Data Communication & Network Technologies. BPB publication

S.NO	Websites
1	https://forgetcode.com/c/1203-crc-generation-in-computer-networks
2	https://gist.github.com/ankurdinge/1202643
3	https://www.geeksforgeeks.org/
4	https://www.thelearningpoint.net/computer-science/c-program
5	www.w3schools.com/tcpip/default.asp
6	http://172.16.25.76/course/view.php?id=1835

SEMESTER-V
PHP PROGRAMMING – PRACTICAL

5H-2C

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

End Semester Exam:3 Hours

Course Objectives (CO)

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

Course Outcomes (COs)

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

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

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

List of Programs

1. Create a PHP page using functions for comparing three integers and print the largest number.
2. Write a function to calculate the factorial of a number (non-negative integer). The function accept the number as an argument.

3. WAP to check whether the given number is prime or not.

4. Create a PHP page which accepts string from user. After submission that page displays the reverse of provided string.

5. Write a PHP script that checks whether a passed string is palindrome or not? (A palindrome is word, phrase, or sequence that reads the same backward as forward, e.g., madam or nurses run)

6. Create a login page having user name and password. On clicking submit, a welcome message should be displayed if the user is already registered (i.e.name is present in the database) otherwise error message should be displayed.

7. Create a simple 'birthday countdown' script, the script will count the number of days between current day and birth day.

8. Create a login page having user name and password. On clicking submit, a welcome message should be displayed if the user is already registered (i.e.name is present in the database) otherwise error message should be displayed.

9. Create a script to construct the following pattern, using nested for loop.

```
*
*
* *
* * *
* * * *
```

10. Using switch case and dropdown list display a ―Hello‖ message depending on the language selected in drop down list.
11. Write a simple PHP program to demonstrate use of various built-in string functions
12. Write a simple PHP program to demonstrate use of simple function and parameterized function

Suggested Readings	
1	David Sklar, Adam Trachtenberg, 2014. PHP Cookbook: Solutions & Examples for PHP.
2	Luke Welling, Laura Thompson,2008. PHP and MySQL Web Development, (4th ed.), Addition Paperback, Addison-Wesley Professsional.
3	Robin Nixon, 2014. Learning PHP, MySQL, JavaScript, CSS & HTML5, (3rd ed.) Paperback, O'reilly.
4	Steven Holzner, 2007. PHP: The Complete Reference Paperback, McGraw Hill Education (India).
5	Timothy Boronczyk, Martin E. Psinas, 2008. PHP and MYSQL (Create-Modify-Reuse), Wiley India Private Limited.

Websites	
1	www.php.net/
2	en.wikipedia.org/wiki/PHP
3	www.w3schools.com/PHP/default.asp
4	http://www.nptelvideos.com/php/php_video_tutorials.php
5	http://172.16.25.76/course/view.php?id=1839

BACHELOR OF COMPUTER TECHNOLOGY

23CTU512B **2023-2024**

SEMESTER-V
.NET PROGRAMMING - PRACTICAL

5H-2C

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

End Semester Exam:3 Hours

Course Objectives

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

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Develop Windows based applications using Visual Basic.Net	Remember
CO2	Learn various tools in .net applications	Understand
CO3	Implement ADO.Net concept in VB.Net and ASP.Net applications	Understand
CO4	Create server-side web applications using ASP.NET	Apply
CO5	Apply techniques to develop error-free software	Analyze

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

Programs

1. Write a Program to perform various string manipulation functions.
2. Using windows application form, create a form, place controls and manipulate data.
3. Write a program to create inventory control using class library.
4. Write a program to create Web Services Using Vb.Net.
5. Write a program to create a screen saver using controls
6. Create an ActiveX program with simple example.
7. Using windows Application: Design Employee Details, use Sql Server as back end and also use checked list box.

ASP.Net

8. Write a program to create an on-line quiz using content page holder.
9. Write a program to retrieve Cookies information
10. Write a program to count web page hits

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

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

SEMESTER-V
INTERNSHIP

0 H-2C

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

B.Sc. COMPUTER TECHNOLOGY
23CTU601 **2023-2024**

SEMESTER-VI
ARTIFICIAL INTELLIGENCE

6H-6C

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

Course Objectives

- To acquire historical perspective on artificial intelligence and its background.
- Understand the basic principles of AI for problem solving, learning and representation of knowledge
- Examine various applications of AI techniques in machine learning models, natural language processing, and expert systems.
- Investigate the machine learning models for analysis and simulation.
- Evaluate the present reach, capability, bounds, and effects of intelligent systems.

Course Outcomes

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

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.	Apply
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 in applying scientific method to models of machine learning.	Apply
CO5	Categorizing the ability of AI, its current scope and limitations, and societal implications.	Analyze

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I - INTRODUCTION TO AI **13 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 **12 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 **12 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 **12 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 **11 Hours**

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

Suggested Reading	
1	Stuart J. Russell, Peter Norvig, "Artificial Intelligence - A Modern Approach", Third Edition, Pearson Publishers, 2015.
2	Elaine Rich, Kevin Knight, Shivashankar B. Nair, "Artificial Intelligence", Third Edition, Tata McGraw-Hill Education, 2008.
3	Kevin Night and Elaine Rich, Nair B. (2017). Artificial Intelligence (SIE), Mc Graw Hill.
4	Deepak Khemani. (2013). Artificial Intelligence, Tata Mc Graw Hill Education.
5	Russell, S. and Norvig, P. (2010). Artificial Intelligence: A Modern Approach, 3 rd Edition, PrenticeHall.
6	George F. Luger. (2009). Artificial Intelligence: Structures and Strategies for Complex Problem Solving, 6th Edition, Pearson Education.
7	Dan W. Patterson. (2007). Introduction to AI and ES, Pearson Education.

Websites	
1	http://nptel.ac.in/courses/106105079/2.
2	https://in.udacity.com/course/intro-to- artificial-intelligence--cs271.
4	https://www.simplilearn.com/tutorials/artificial-intelligence-tutorial/what-is-artificial-intelligence
5	https://news.microsoft.com/wp-content/uploads/prod/sites/93/2020/04/Student-Guide-Module-1-Fundamentals-of-AI.pdf.
6	https://www.ics.uci.edu/~dechter/courses/ics-171/fall-06/lecture-notes/intro-class.ppt
7	https://nptel.ac.in/courses/112/103/112103280/
8	https://study.com/academy/topic/fundamentals-of-artificial-intelligence.html

B.Sc. COMPUTER TECHNOLOGY
23CTU602A **2023-2024**

SEMESTER-VI
DATA SCIENCE USING R PROGRAMMING

6H-6C

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

Course Objectives (COs)

- To know the fundamental concepts of data science and analytics.
- To learn fundamental data analysis using R.
- To understand various data modeling techniques.
- To know the basics of Exploratory Data Analysis.
- To study reproducible research and various tools
- To understand, and practice big data analytics and machine learning approaches

Course Outcomes (COs)

COs	Course Outcomes	BT Level
CO1	Apply the knowledge of R gained to data Analytics for real life applications.	Apply
CO2	Know about basics in R programming language	Analyze
CO3	Understand various methods involved in exploratory data analysis	Analyze
CO4	Understand about actionable knowledge and various data analysis software	Understand
CO5	Understand the need of cleaning data before analyzing	Understand

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

Unit I - Data Scientist's Tool box **(12 hours)**

Turning data into actionable knowledge, introduction to the tools that will be used in building data analysis software; version control, markdown, git, GitHub, R and R-Studio.

Unit II - R Programming basics **(12 hours)**

Overview of R, R datatypes and Objects, reading and writing data, control structures, functions, scoping rules, dates and time, loop functions, debugging tools, simulation, code profiling.

Unit III - Getting and Cleaning Data **(12 hours)**

Obtaining data from the web, from API's, from database, and from colleagues in various formats. Basics of data cleaning and making data –tidy.

Unit IV - Exploratory Data Analysis **(12 hours)**

Essential exploratory techniques for summarizing data, applied before formal modelling commences, eliminating or sharpening potential hypotheses about the world that can be addresses by the data, common multivariate statistical techniques used to visualize high-dimensional data.

Unit V - Reproducible Research **(12 hours)**

Concepts and tools behind reporting modern data analysis in a reproducible manner, To write a document using R markdown, integrate live R code into a literate statistical program, compile R markdown documents using knitr and related tools, and organize a data analysis so that it is reproducible and accessible to others.

Suggested Readings

1.	Vijay Kotu, Bala Deshpande (2018), Data Science: Concepts and Practice, 2nd edition, Morgan Kaufmann publishers.
2.	Hadley Wickham, Garrett Grolemund (2016), R for Data Science: Import, Tidy, Transform, Visualize, and Model Data, O' Reilly Publications
3.	Rachel Schutt, Cathy O'Neil (2013). Doing data science: Straight Talk from the frontline. S.Chroff/O' Reilly
4.	Foster Provost, Tom Fawcett (2013). Data science for Business – What you need to know about Datamining and Data Analytic Thinking. O'Reilly
5.	John. W. Foreman (2013). Data Smart: Using Data science to transform information into insight. John Wiley and Sons.
6.	Eric Seigel (2013). Predictive Analytics: The Power of Predict who will click, Buy Lie or Die (1st ed.). Wiley.
7.	Matthew A.Russel (2013). Mining the social webL: Datamining Facebook, Twitter, LinkedIn, Google+, GitHub, and More (2nd ed.). O'Reilly Media
8.	Ian Ayres (2007). Super Crunchers: Why Thinking – By – Numbers is the New way to Be Smart (1st ed.). Bantam

Websites

1.	https://nptel.ac.in/courses/106106212/
2.	http://172.16.25.76/course/view.php?id=371

BACHELOR OF COMPUTER TECHNOLOGY

23CTU602B **2023-2024**

SEMESTER-VI

BIG DATA ANALYTICS

6H-6C

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

End Semester Exam:3 Hours

Course Objectives (CO)

- To provide an overview of an exciting growing field of big data analytics.
- To impart to students the skills required to design scalable systems that can accept, store, and analyze large volumes of unstructured data.
- The objective of this course is to ascertain that the students know the fundamental techniques and tools used to design and analyze large volumes of data.
- To teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.
- To enable students to have skills that will help them to solve complex real-world problems in for decision support.
- To understand, and practice big data analytics and machine learning approaches

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Explain the motivation for big data systems and identify the main sources of Big Data in the real world.	Understand
CO2	Demonstrate an ability to use frameworks like Hadoop, NOSQL to efficiently store retrieve and process Big Data for Analytics.	Apply
CO3	Understand the key issues in big data management and its associated applications in intelligent business and scientific computing.	Understand
CO4	Interpret business models and scientific computing paradigms, and apply software tools for big data analytics.	Apply
CO5	Achieve adequate perspectives of big data analytics in various applications like recommender systems, social media applications etc.	Apply

Mapping with Programme Outcomes

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

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 NO SQL 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	EMC Education Services (2018), “Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data”, Wiley publishers.
2	Dietmar Jannach and Markus Zanker,(2017), “Recommender Systems: An Introduction”, Cambridge University Press.
3	Kim H. Pries and Robert Dunnigan,(2016) “Big Data Analytics: A Practical Guide for Managers ” CRC Press.
4	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.
5	David Loshin,(2016), “Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph”, Morgan Kaufmann/El sevier Publishers.

Websites	
1	https://www.ibm.com/analytics/big-data-analytics
2	https://www.simplilearn.com/what-is-big-data-analytics-article
3	https://www.youtube.com/watch?v=AMRDgIKcjjU

SEMESTER-VI

ENTREPRENEURSHIP

6H-5C

Instruction Hours/week: L:6 T:0 P:0 **Marks:** Internal**:40** External**:60 T**otal**: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 analyse 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.

S.NO	SUGGESTED READINGS:
1	Robert Hisrich and Michael Peters and Dean Shepherd (2018), Entrepreneurship, 10 th Edition,
2	McGraw Hill, New Delhi.
3	David H. Holt (2016), Entrepreneurship, 1st Edition, Pearson Education, New Delhi.
4	Sangeetha Sharma (2017), Entrepreneurship Development, PHI Learning Pvt Ltd., New Delhi.
5	Poornima M., Charantimath (2018), Entrepreneurship Development and Small Business

S.NO	Websites
1	https://www.freEBook Source:centre.net/Business/Entrepreneurship-Books.html
2	https://nptel.ac.in/courses/110/107/110107094/
3	http://172.16.13.33/course/view.php?id=386

BACHELOR OF COMPUTER TECHNOLOGY
23CTU611 **2023-2024**

SEMESTER-VI
ARTIFICIAL INTELLIGENCE – PRACTICAL
4H-2C

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

Course Objectives (CO)

- To understand the various characteristics of Intelligent agents
- To learn about the different search strategies in AI
- To learn to represent knowledge in solving AI problems
- To understand the different ways of designing software agents
- To know about the various applications of AI.
- Understand the various searching techniques, constraint satisfaction problem and example problems- game playing techniques.

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

COs	Course Outcomes	Blooms Level
CO1	Identify problems that are amenable to solution by AI methods.	Analyze
CO2	Identify appropriate AI methods to solve a given problem	Identify
CO3	Formalize a given problem in the language/framework of different AI methods.	Apply
CO4	Implement basic AI algorithms	Apply
CO5	Design and carry out an empirical evaluation of different algorithms on a problem formalization, and state the conclusions that the evaluation supports.	Apply

Mapping with Programme Outcomes

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

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

List of Programs

1. Write the following programs using PROLOG
2. Program to read address of a person using compound variable.
3. Program of fun to show concept of cut operator.
4. Program to count number of elements in a list.
5. Program to find member of a set.
6. Program to concatenate two sets.
7. Program to find permutation of a set.
8. Program to demonstrate family relationship.
9. Write a program to solve N queens problem
10. Solve any problem using depth first search.
11. Solve any problem using best first search.
12. Solve traveling salesman problem.

S.NO	Suggested Readings
1	Kevin Night and Elaine Rich, Nair B., "Artificial Intelligence (SIE)", Mc Graw Hill-2017.
2	Dan W. Patterson, "Introduction to AI and ES", Pearson Education, 2007.
3	Ivan Brako, PROLOG: Programming for Artificial Intelligence,3rd edition Pearson, 2011
4	Peter Jackson, "Introduction to Expert Systems", 3rd Edition, Pearson Education, 2007.
5	Stuart Russel and Peter Norvig "AI – A Modern Approach", 2nd Edition, Pearson Education 2007.
6	Deepak Khemani "Artificial Intelligence", Tata Mc Graw Hill Education 2013.

S.NO	Websites
1	https://nptel.ac.in/courses/106/105/106105077/

23CTU691

SEMESTER-VI

PROJECT

8H-4C

Instruction Hours/week: L:0 T:0 P:8 **Marks:** Internal**:40** External**:60 T**otal**:100**

End Semester Exam:3 Hours

SEMESTER- VII

J2EE

6H-6C

Instruction Hours/week: L:6 T:0 P:0 **Marks:** Internal**:40** External**:60 T**otal**:100**

End Semester Exam:3 Hours

Course Objectives

- Learn the fundamental knowledge about JDBC, RMI, JSP applications.
- The student will learn to apply the concepts of servlet for developing.
- Understand the different type of listeners which is used for servlet programming.
- Understand and apply the concept of JSP program for developing.
- The student will understand and apply the concepts of MVC and Tag libraries.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Understand the fundamentals of JDBC and JSP applications.	Understand
CO2	Apply the concept of Servlet and RMI application using JDBC	Apply
CO3	Understand how to manage console JSP and Java Beans.	Understand
CO4	Understand how to implement MVC, Hibernate and EJP concepts.	Understand
CO5	Apply the concepts of spring and struts.	Apply

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I – J2EE Platform, JDBC **14 Hours**

Introduction to J2EE- Enterprise Architecture Styles – J2EE platform – Introduction to J2EE APIs – Introduction to Containers – JDBC -JDBC Architecture – Processing Queries – Database Exceptional Handling – Types of JDBC Drivers – JDBC API for Database Connectivity – Statement – Prepared statement – Collable statement – ResultSetMetaData.

UNIT II – RMI Servlet **14Hours**

RMI Overview – Architecture – Stub and Skeleton – Developing and executing RMI Applications – Servlet Introduction – Architecture – Servlet APIs – Servlet Lifecycle – Developing and Deploying Servlets – Session tracking Approaches (URl Rewriting, Hidden Form Fields, Cookies, Session API) – Servlet Collaboration – Servlet with JDBC.

UNIT III- JSP, Java Beans **14 Hours**

Introduction to JSP Basics – JSP Vs Servlet – JSP Architecture – JSP Elements – JSP implement Objects – Including and forwarding from JSP pages – Working with Session and cookie in JSP – Error Handling and Exceptional Handing in JSP - JDBC with JSP – JavaBean Methods – JavaBean Properties – Common JavaBean Packaging.

UNIT IV – MVC Architecture, EJP and Hibernate **15 Hours**

Introduction to MVC – MVC Architecture – Benefits of EJP – Types of EJP – Session Beans – Entity Beans – Message-Driven Beans – Timer Service – Introduction to Hibernate – Need for Hibernate – Features of Hibernate – Exploring Hibernate Architecture – Jar Files of Hibernate – Hibernate Configuration Files – Hibernate Mapping Files – Hibernate Inheritance – Hibernate Annotations.

UNIT V- Spring, Struts **15 Hours**

Introduction of Spring Framework – Spring Architecture – Spring Framework definition – Spring and MVC – Spring Context – Inversion of Control (IoC) in spring – Aspect Oriented Programming in Spring (AOC) - Understanding Struts Framework – Comparision with NVC using RequestDispatcher – Struts flow of Control – Processing Request with Action Objects – Handling Request parameters with Form Beans – Using Property Files.

S.NO	SUGGESTED READINGS
1	Java Complete Reference 11th Edition - Herbert Schildt, Oracle Press
2	Java Server Programming For Professionals, Ivan Bayross, Sharanam Shah – Shroff publication
3	Developing Java Servlets – Techmedia
4	JSP Beginner's Guide – Tata McGraw Hill by Gary Bolling, Bharathi Natarajan
5	Spring and Hibernate, K. Santosh Kumar, - Tata McGraw-Hill
6	Hibernate Made Easy: Simplified Data Persistence with Hibernate and JPA (Java Persistence API) Annotations by Cameron Wallace McKenzie, Kerri Sheehan
7	Spring Framework: A Step by Step Approach for Learning Spring Framework - CreateSpace Independent Publishing Platform
8	Beginning Hibernate Second Edition By Jeff Linwood, Dave Minte – Apress

S.NO	WEB LINKS:
1	www.programmingsimplified.com
2	www.programiz.com / j2ee-programming
3	www.j2ee.com
4	https://nptel.ac.in/courses/106101208/

B.Sc. COMPUTER TECHNOLOGY

23CTU702 **2023-2024**

SEMESTER- VII

DATA VISUALIZATION

6H-6C

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

End Semester Exam:3 Hours

Course Objectives

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

Course Outcomes

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

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

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I **15 Hours**

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

UNIT II **15 Hours**

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

UNIT III **14 Hours**

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

UNIT IV **14 Hours**

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

UNIT V **14 Hours**

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

Suggested Readings	
1	Jon Raasch, Graham Murray, Vadim Ogievetsky, Joseph Lowery, "JavaScript and jQuery for Data Analysis and Visualization", WROX
2	Ritchie S. King, Visual story telling with D3" Pearson
3	Ben Fry, "Visualizing data: Exploring and explaining data with the processing environment", O'Reilly, 2008.
4	Tamara Munzner, Visualization Analysis and Design, AK Peters Visualization Series, CRC Press, Nov. 2014
5	Nathan Yau, "Data Points: Visualization that means something", Wiley, 2013.

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

SEMESTER- VII
STATISTICAL COMPUTING

6H-6C

Instruction Hours/week: L:6 T:0 P:0 **Marks:** Internal**:40** External**:60 T**otal**: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	Pillai R.S.N., and Bagavathi V., (2002). Statistics, S. Chand & Company Ltd, New Delhi
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/

SEMESTER- VII

J2EE – 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 Understand the In-depth concepts of JEE
- To Understand the in-depth Life cycle of servlets and JSP.
- To Learn how to communicate with databases using Java.
- To Handle Errors and Exceptions in Web Applications
- To Use NetBeans IDE for creating J2EE Applications
- To impart expertise in Web Application Development using J2EE.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Understand the In-depth concepts of JEE	Understand
CO2	Understand the in-depth Life cycle of servlets and JSP.	Understand
CO3	Learn how to communicate with databases using Java.	Learn
CO4	Handle Errors and Exceptions in Web Applications	Analyze
CO5	Use NetBeans IDE for creating J2EE Applications	Apply

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

List of Programs

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

S.NO	SUGGESTED READINGS
1	Jim Keogh. (2018). The Complete Reference J2EE 1st edtion New Delhi: Tata McGraw Hill.
2	Duane, K. Fields., & Mark, A. Kolb. (2017). Web Development with Java Server Pages (1st ed.). Pune: Manning Publications.
3	Rod Johnson. (2017). J2EE Development without EJB 1st edition. New Delhi:Wiley Dream Tech.
4	Rod Johnson., & Rod Johnson, P.H. (2016). Expert One-On-One J2EE Design and Development. New Delhi: John Wiley & Sons.
5	Paul, J. Perrone., Venkata, S. R. Chaganti., Venkata S. R. Krishna., & Tom Schwenk. (2016). J2EE Developer's Handbook. New Delhi: Sams Publications.
6	Joseph, J. Bambara et al. (2016). J2EE Unleashed (1st ed.). New Delhi:Tech Media.

S.NO	WEBSITES
1	https://www.oracle.com/technetwork/java/javaee/appmodel-135059.html
2	https://www.geeksforgeeks.org/introduction-java-servlets/
3	http://media.datadirect.com/download/docs/jdbc/alljdbc/jdbcconnect/j2ee.html
4	https://www.javatpoint.com/ejb-tutorial
5	https://www.javatpoint.com/jsp-tutorial
6	https://nptel.ac.in/courses/106105191/

SEMESTER-VII
DATA VISULAIZATION- PRACTICAL

6H-3C

Instruction Hours/week: L: T:0 P:6 **Marks:** Internal**:40** External**:60 T**otal**:100**

End Semester Exam:3 Hours

Course Objectives

- To interpret data plots and understand core data visualization concepts such as correlation, linear relationships, and log scales.
- To explore the relationship between two continuous variables using scatter plots and line plots.
- To translate and present data and data correlations in a simple way, data analysts use a wide range of techniques — charts, diagrams, maps, etc.
- Learning appropriate methods for collecting, analyzing, and interpreting numerical information.
- Developing specific skills, competencies, and points of view needed by professionals in the field most closely related to this course

Course Outcomes

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

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

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

LIST OF PROGRAMS

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

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

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

B.Sc. COMPUTER TECHNOLOGY

23CTU801 **2023-2024**

SEMESTER-VIII -A

MONGO DB

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 provide students the knowledge and skills to master the NoSQL database mongoDB.
- To Write MongoDB programs from JavaScript shell.
- To define, compare and use of MongoDB with other RDBMS
- To explain the detailed architecture, define objects, load data, query data and performance tune of MongoDB
- To perform query optimization in MongoDB
- To understand replication and sharding in MongoDB

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	To provide students the right skills and knowledge needed to run Applications on mongoDB	Understand
CO2	Writing MongoDB programs from JavaScript shell.	Apply
CO3	Explain the detailed architecture, define objects, load data, query data and performance tune of MongoDB	Understand
CO4	Perform query optimization in MongoDB	Apply
CO5	Understand replication and sharding in MongoDB	Understand

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

Unit I - GETTING STARTED

A database for the modern web – MongoDB through the JavaScript shell – Writing programs using MongoDB- MongoDB Document Model

Unit II - APPLICATION DEVELOPMENT

Document-oriented data – Principles of schema design – Designing an e-commerce data model – Nuts and bolts on databases, collections, and documents. Queries and aggregation – E-commerce queries – MongoDB's query language – Data Types in MongoDB -Aggregating orders – Aggregation in detail.

Unit III - UPDATES, ATOMIC OPERATIONS, AND DELETES 15 Hours

A brief tour of document updates – E-commerce updates – Atomic document processing – MongoDB updates and deletes. Indexing and query optimization: Indexing theory – Indexing in practice.

Unit IV – REPLICATION 14 Hours

Overview – Replica sets – Master-slave replication – Drivers and replication. Shading: Overview – A sample shard cluster – Querying and indexing a shard cluster – Choosing a shard key.

Unit V - DEPLOYMENT AND ADMINISTRATION 14 Hours

Deployment – Monitoring and diagnostics – Maintenance – Performance troubleshooting.

S.NO	SUGGESTED READINGS
1	Shakuntala Gupta Edward. (2018). Practical Mongo DB , 2nd edition, Apress Publications, ISBN 1484206487
2	Rick Copeland. (2017). MongoDB Applied Design Patterns, 1st Edition, O"Reilly Media Inc.
3	Mike Wilson.. (2017). Building Node Applications with MongoDB and Backbone, O"Reilly Media Inc.
4	Kyle Banker. (2016). MongoDB in Action. Manning Publications Co.
5	Gautam Rege, (2016). Ruby and MongoDB Web Development Beginner's Guide. Packt Publishing Ltd
6	David Hows. (2016). The definitive guide to MongoDB, 2nd edition, Apress Publication, 8132230485
7	Swetha Siriah, Bhushan Deshpande, Deepak Asudani,"**MongoDB with Privacy Access Control "**, International Journal of Research and Review, Vol.5; Issue: 6; June 2018

S.NO	WEBSITES
1	http://www.mongodb.org/about/production-deployments/
2	http://docs.mongodb.org/ecosystem/drivers/
3	http://www.mongodb.org/about/applications/
4	http://www.mongodb.org/
5	https://nptel.ac.in/courses/106106156/

SEMESTER-VIII -A
INTERNET OF THINGS

6H-5C

Instruction Hours/week: L:6 T:0 P:0 **Marks:** Internal**:40** External**:60 T**otal**: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 understand smart objects and IoT Architecture.
- The student will learn various tools of IoT related Protocols.
- To build simple IoT systems using open hardware such as Arduino and Raspberry Pi.
- To understand Data analytics concepts using IoT.
- The student will reinforcing the concepts of IoT to design an IoT based smart system using open hardware platforms and open cloud offerings.

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	Understand the different real world IoT applications and its functions.	Understand
CO2	Apply of IoT Protocols in Security and Optimizing Networks.	Apply
CO3	Understand how to use Routing and Lossy Network Protocol and Service Protocols.	Understand
CO4	Understand how to manage structured and unstructured data in data analytics framework.	Understand
CO5	Apply the concepts of IoT in various smart systems.	Apply

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

UNIT I – FUNDAMENTALS OF IOT 15 Hours

Evolution of Internet of Things – Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT Models – Simplified IoT Architecture and Core IoT Functional Stack – Fog, Edge and Cloud in IoT – Functional Blocks of an IoT Ecosystem – Sensors, Actuators, and Smart Objects – Open Hardware Platforms for IoT.

UNIT II – IOT PROTOCOLS – I 14 Hours

IoT Access Technologies: Physical and MAC Layers, Topology and Security of IEEE 802.15.4, 1901.2a, 802.11ah and LoRaWAN – Network Layer: Constrained Nodes and Constrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo.

UNIT III – IOT PROTOCOLS – II **14 Hours**

Routing over Low Power and Lossy Networks (RPL) – Application Transport Methods: Application Layer Not Present, Supervisory Control and Data Acquisition (SCADA) – Application Layer Protocols: CoAP and MQTT – Service discovery – mDNS.

UNIT IV- CLOUD, FOG, DATA ANALYTICS FRAMEWORK **15 Hours**

Cloud and Fog Topologies – Cloud Services Model – Fog Computing – Structured versus Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning – No SQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark – Edge Streaming Analytics and Network Analytics – Security in IoT – CISCO IoT System – IBM Watson IoT Platform.

UNIT V- IOT APPLICATIONS **14 Hours**

Smart and Connected Cities: Street Layer, City Layer, Data Center Layer and Services Layer, Street Lighting, Smart Parking Architecture and Smart Traffic Control – Smart Transportation – Connected Cars.

SUGGESTED READINGS Suggested Readings	
1	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton, Jerome Henry, “IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things”, CISCO Press, 2017.
2	Perry Lea, “Internet of things for architects”, Packt, 2018.
3	Jan Ho¨ller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Savesand, David Boyle, “From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence”, Elsevier, 2014.
4	Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key Applications and Protocols”, Wiley, 2012.
5	Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), “Architecting the Internet of Things”, Springer, 2011.
6.	Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A hands-on Approach”, Universities Press, 2015.

WEB LINKS	
1.	https://www.arduino.cc/
2.	https://www.ibm.com/smarterplanet/us/en/?ca=v_smarterplanet

SEMESTER- VIII-A
ORGANIZATIONAL BEHAVIOR

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

COURSE OUTCOMES:

Learners should be able to
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 behaviortheories and concepts.	Analyze
CO2	Assess the behavior of the individuals and groups in organization 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 caseanalysis 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 : Introduction **12 HOURS**

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

UNIT II : 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.

S.NO	Suggested Readings:
1	Fred Luthans. (2017). *Organizational Behavior: An Evidence - Based Approach*, 12th edition,Mcgraw Hill Education, NewDelhi.
2	Steven Mcshane and Mary Ann VonGlinow (2017), *Organizational Behavior*, 6th edition, McGrawHill Education, NewDelhi
3	Robbins, S. P., and Judge, T.A. (2016). *Organizational Behaviour*.(16th edition).New Delhi: PrenticeHall of India.
4	Laurie J. Mullins (2016), *Management and Organisationalbehaviour*, 10th edition, PearsonEducation, NewDelhi
5	Robbins, S. P., and Judge, T.A. (2016). *Essentials of Organizational Behavior*.13 edition, PearsonEducation.

S.NO	E- Resources:
1	https://nptel.ac.in/courses/110/105/110105033/

SEMESTER- VIII-A
MONGODB -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 Write MongoDB programs from JavaScript shell.
- To define, compare and use of MongoDB with other RDBMS
- To explain the detailed architecture, define objects, load data, query data and performance tune of MongoDB
- To perform query optimization in MongoDB
- To understand replication and sharding in MongoDB

Course Outcomes

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

COs	Course Outcomes	Blooms Level
CO1	To provide students the right skills and knowledge needed to develop Applications on mongoDB	Understand
CO2	To provide students the right skills and knowledge needed to run Applications on mongoDB	Apply
CO3	Writing MongoDB programs from JavaScript shell.	Understand
CO4	Explain the detailed architecture, define objects, load data, query data and performance tune of MongoDB	Understand
CO5	Perform query optimization in MongoDB	Apply

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

List of Programs

Structure of 'restaurants' collection :

{ "address": { "building": "1007", "coord": [-73.856077, 40.848447], "street": "Morris Park Ave", "zipcode": "10462" }, "borough": "Bronx", "cuisine": "Bakery", "grades": [{ "date": { "$date": 1393804800000 }, "grade": "A", "score": 2 }, { "date": { "$date": 1378857600000 }, "grade": "A", "score": 6 }, { "date": { "$date": 1358985600000 }, "grade": "A", "score": 10 }, { "date": { "$date": 1322006400000 }, "grade": "A", "score": 9 }, { "date": { "$date": 1299715200000 }, "grade": "B", "score": 14 }, "name": "Morris Park Bake Shop", "restaurant_id": "30075445" }

1. Write a MongoDB query
    a. to display all the documents in the collection restaurants.
    b. to display the fields restaurant_id, name, borough and cuisine for all the documents in the collection restaurant.
    c. to display the fields restaurant_id, name, borough and cuisine, but exclude the field _id for all the documents in the collection restaurant
    d. to display the fields restaurant_id, name, borough and zip code, but exclude the field _id for all the documents in the collection restaurant.
    e. to display all the restaurant which is in the borough Bronx
    f. to display the first 5 restaurant which is in the borough Bronx.
    g. to display the next 5 restaurants after skipping first 5 which are in the borough Bronx.
    h. to find the restaurants who achieved a score more than 90.
    i. to find the restaurants that achieved a score, more than 80 but less than 100.
2. Write a MongoDB query
    a. to find the restaurants which locate in latitude value less than -95.754168.
    b. to find the restaurants that do not prepare any cuisine of 'American' and their grade score more than 70 and latitude less than -65.754168.
    c. to find the restaurants which do not prepare any cuisine of 'American' and achieved a score more than 70 and not located in the longitude less than - 65.754168. Note : Do this query without using $and operator. Go to the editor
    d. to find the restaurants which do not prepare any cuisine of 'American ' and achieved a grade point 'A' not belongs to the borough Brooklyn. The document must be displayed according to the cuisine in descending order.
3. Write a MongoDB query
    a. to find the restaurant Id, name, borough and cuisine for those restaurants which contain 'Wil' as first three letters for its name. Go to the editor
    b. to find the restaurant Id, name, borough and cuisine for those restaurants which contain 'ces' as last three letters for its name.
    c. to find the restaurant Id, name, borough and cuisine for those restaurants which contain 'Reg' as three letters somewhere in its name.
4. Write a MongoDB query
    a. to find the restaurants which belong to the borough Bronx and prepared either American or Chinese dish.
    b. to find the restaurant Id, name, borough and cuisine for those restaurants which belong to the borough Staten Island or Queens or Bronxor Brooklyn.
    c. to find the restaurant Id, name, borough and cuisine for those restaurants which are not belonging to the borough Staten Island or Queens or Bronxor Brooklyn.
    d. to find the restaurant Id, name, borough and cuisine for those restaurants which achieved a score which is not more than 10.

e. to find the restaurant Id, name, borough and cuisine for those restaurants which prepared dish except 'American' and 'Chinees' or restaurant's name begins with letter 'Wil'.
f. to find the restaurant Id, name, and grades for those restaurants which achieved a grade of "A" and scored 11 on an ISODate "2014-08- 11T00:00:00Z" among many of survey dates
g. to find the restaurant Id, name and grades for those restaurants where the 2nd element of grades array contains a grade of "A" and score 9 on an ISODate "2014-08-11T00:00:00Z".

5. Write a MongoDB query to find the restaurant Id, name, address and geographical location for those restaurants where 2nd element of coord array contains a value which is more than 42 and upto 52
6. Write a MongoDB query
   a. to arrange the name of the restaurants in descending along with all the columns.
   b. to arranged the name of the cuisine in ascending order and for that same cuisine borough should be in descending order.
7. Write a MongoDB query to know whether all the addresses contains the street or not.
8. Write a MongoDB query which will select all documents in the restaurants collection where the coord field value is Double.
9. Write a MongoDB query which will select the restaurant Id, name and grades for those restaurants which returns 0 as a remainder after dividing the score by 7.
10. Write a MongoDB query to find the restaurant name, borough, longitude and attitude and cuisine for those restaurants which contains 'mon' as three letters somewhere in its name.

S.NO	SUGGESTED READINGS
1	Shakuntala Gupta Edward. (2018). Practical Mongo DB , 2nd edition, Apress Publications, ISBN 1484206487
2	Rick Copeland. (2017). MongoDB Applied Design Patterns, 1st Edition, O‟Reilly Media Inc.
3	Mike Wilson.. (2017). Building Node Applications with MongoDB and Backbone, O‟Reilly Media Inc.
4	Kyle Banker. (2016). MongoDB in Action. Manning Publications Co.
5	Gautam Rege, (2016). Ruby and MongoDB Web Development Beginner's Guide. Packt Publishing Ltd
6	David Hows. (2016). The definitive guide to MongoDB, 2nd edition, Apress Publication, 8132230485

S.NO	WEBSITES
1	http://www.mongodb.org/about/production-deployments/
2	http://docs.mongodb.org/ecosystem/drivers/
3	http://www.mongodb.org/about/applications/
4	http://www.mongodb.org/
5	https://nptel.ac.in/courses/106106156/

SEMESTER- VIII-A

INTERNET OF THINGS - PRACTICAL

6H-3C

Instruction Hours/week: L:0 T:0 P:6 **Marks:** Internal**:40** External**:60 T**otal**:100**

End Semester Exam:3 Hours

Course Objectives

- Describe what IoT is and how it works today
- Recognise the factors that contributed to the emergence of IoT
- Design and program IoT devices
- Use real IoT protocols for communication
- Secure the elements of an IoT device

Course Outcomes (CO)

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

COs	Course Outcomes	Blooms Level
CO1	Choose the sensors and actuators for an IoT application (L1)	Understand
CO2	Select protocols for a specific IoT application (L2)	Apply
CO3	Utilize the cloud platform and APIs for IoT application (L3)	Understand
CO4	Experiment with embedded boards for creating IoT prototypes(L3)	Understand
CO5	Design a solution for a given IoT application (L6)	Apply

Mapping with Programme Outcomes

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

S-Strong; M-Medium; L-Low

List of Programs:

1. Select any one development board (Eg., Arduino or Raspberry Pi) and control LED using the board.
2. Using the same board as in (1), read data from a sensor. Experiment with both analog and digital sensors.
3. Control any two actuators connected to the development board using Bluetooth.
4. Read data from sensor and send it to a requesting client. (using socket communication)
5.
6. Note: The client and server should be connected to same local area network.
7. Create any cloud platform account, explore IoT services and register a thing on the platform.
8. Push sensor data to cloud.

9. Control an actuator through cloud.
10. Access the data pushed from sensor to cloud and apply any data analytics or visualization services.
11. Create a mobile app to control an actuator.

S.NO	SUGGESTED READINGS
1	Third Generation Partnership Project, Technical Report 36.888 v12.0.0, Study on Provision of Low-cost Machine-Type Communications (MTC) User Equipment (UEs) Based on LTE, 2013.
2	Third Generation Partnership Project, Technical Report 45.820 v13.0.0, Cellular System Support for Ultralow Complexity and Low Throughput Internet of Things, 2016.
3	Third Generation Partnership Project, Technical Specification 23.060 v14.0.0, General Packet Radio Service (GPRS); Service Description; Stage 2, 2016.
4	Third Generation Partnership Project, Technical Specification 24.008 v14.0.0, Mobile Radio Interface Layer 3 Specification; Core Network Protocols; Stage 3, 2016.
5	Third Generation Partnership Project, Technical Specification 36.211 v14.0.0, Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Channels and Modulation, 2016.

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 knowlegede on anlaysis 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 – Significance of 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.

S.NO	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",
7	Entrepreneur Press.
8	David Hunt, Long Nguyen, Matthew Rodgers, (2007) "Patent searching: tools & techniques", Wiley.
9	The Institute of Company Secretaries of India, Statutory body under an Act of parliament,"Professional Programme Intellectual Property Rights, Law and practice", September 2013.

S.NO	Websites:
1	https://www.scribbr.com/dissertation/methodology/
2	https://www.educba.com/types-of-research-methodology/
3	https://www.wipo.int/about-ip/en/

SEMESTER-VIII-B

SPSS - PRACTICAL

6H-4C

Instruction Hours/week: L:0 T:0 P:6 **Marks:** Internal**:40** External**:60 T**otal**:100**

End Semester Exam:3 Hours

COURSE OBJECTIVES:

To make the students

- To compute descriptive statistics
- To calculate parametric and non-parametric tests
- To carryout reliability and normality tests
- To comprehend the application of Bivariate and multivariate analysis
- To compute bivariate and multivariate analysis
- To apply statistical techniques on decision making

COURSE OUTCOMES:

Learners should be able to

COs	Course Outcomes	Blooms Level
CO1	Compute descriptive statistics	Understand
CO2	Calculate parametric and non-parametric tests	Apply
CO3	Carryout reliability and normality tests	Analyze
CO4	Comprehend the application of Bivariate and multivariate analysis	Apply
CO5	Compute bivariate and multivariate analysis	Apply

Mapping with Programme Outcomes

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

EXERCISES

1. Simple Frequency
2. Descriptive Statistics
3. Test of Reliability
4. Test of Normality
5. Independent ‘t’Test
6. Analysis of Variance (ANOVA)
7. Paired ‘t’ Test
8. Chi-square

9. Mann Whitney U Test
10. Kruskal Wallis H Test
11. Wilcoxon Test
12. Correlation
13. Regression
14. Factor Analysis
15. Garrett Ranking

S.NO	SUGGESTED READINGS
1	Darren George, Paul Mallery (2016), IBM SPSS Statistics 23 Step by Step, Routledge, New Delhi.
2	Asthana and Braj Bhushan (2017), Statistics for Social Sciences (With SPSS Applications), Prentice Hall of India, New Delhi
3	Keith Mccormick, Jesus Salcedo, Aaron Poh, SPSS Statistics for Dummies, 3rd Edition, Wiley, New Delhi.
4	Keith McCormick, Jesus Salcedo, Jon Peck, Andrew Wheeler, Jason Verlen (2017), SPSS Statistics for Data Analysis and Visualization, Wiley, New Delhi.
5	Brian C. Cronk (2016), How to Use SPSS®: A Step-By-Step Guide to Analysis and Interpretation, 9th Edition, Routledge, New Delhi

SEMESTER-VIII-B
RESEARCH PROJECT/PREPARATION OF RESEARCH PROJECT

18H-12C

Instruction Hours/week: L:0 T:0 P:18 **Marks:** Internal**:100** External**:200 T**otal**:300**

End Semester Exam:3 Hours

KARPAGAM ACADEMY OF HIGHER EDUCATION
(Deemed to be University)
(Established Under Section 3 of UGC Act, 1956)
(Accredited With A + Grade by NAAC in the Second Cycle)
Pollachi Main Road, Eachanari Post, Coimbatore – 641 021
Tamil Nadu, India.

Department of Computer Technology

VALUE-ADDED COURSES

23BEMC551 MOBILE APPLICATION DEVELOPMENT 1H-0C

Instruction Hours/week: L:1 T:0 P:0 **Marks: Internal:100 External:0 Total:100**

End Semester Exam:3 Hours

PRE-REQUISITES: Java Programming

Course Objectives

The goal of this course for the students is to

- 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

Upon completion of this course the students will be able to

- Explain the overview of android with its states and lifecycle.
- Apply the mobile applications for e-marketing in Android and iPhone.
- Analyze mobile databases and various types of testing.
- Develop the simple android applications.
- Evaluate alternative mobile frameworks, and contrast different programming platforms.
- Implement the android applications in different field with modern tools.

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 onmobile 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

REFERENCE BOOK

1. 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

23BECSOE01 INTERNET OF THINGS 1H-0C

Instruction Hours/week: L:1 T:0 P:0 Marks: Internal:40 External:60 Total:100

End Semester Exam:3 Hours

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

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

- Explain about IoT architecture and its applications.
- Identify the feasibility and potential impact of IoT solutions in different industries.
- Apply a systematic and structured approach to designing IoT solutions.
- Summarize techniques to secure the elements of an IoT device.
- Illustrate security protocols in various domains of industrial applications.

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

REFERENCE BOOKS:

1. Olivier Hersent, Omar Elloumi and David Boswarthick,"The Internet of Things: Applications to the Smart Grid and Building Automation", Wiley, 2018
2. 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

23BTFTOE02 NUTRITION AND DIETETICS 1H-0C

Instruction Hours/week: L:1 T:0 P:0 **Marks: Internal:40 External:60 Total:100**

End Semester Exam:3 Hours

Course Objectives

The goal of this course is for students,

- To explain the basic concepts of food and nutrition.
- To define the overall classification, function, and source of carbohydrates, lipids and proteins.
- To summarize the availability, source, deficiency and physiological role of fat 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

- Explain the basics in the area of nutritional assessment in health and disease.
- Outline the biological functions of various macromolecules in terms of food and health.
- Discuss the balanced diet for healthy life to avoid or prevent the deficiency disorders.
- Infer an appropriate diet, products that prevent vitamin deficiency disorders.
- Identify the proper foods rich in minerals to live a healthy life.

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 age groups - 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 Carbohydrates, 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 FatSoluble Vitamins: Vitamin A, Vitamin D, E & K. *f* Water soluble vitamins: Vitamin C,Thiamine, Riboflavin, Niacin, Pantothenic acid, Biotin, Folic acid, Vitamin B12, VitaminB6. Stability under different food processing conditions.

UNIT IV – MINERALS AND WATER

Physiological role, bio-availability, requirements, sources and deficiency of Macro minerals: Calcium, Phosphorus Magnesium, Sodium, Potassium chloride. Micro minerals: 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 nutrigenomics, nutraceuticals etc.

SUGGESTED READINGS:

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

23BTFTOE04 AGRICULTURAL WASTE AND BYPRODUCTS UTILIZATION 1H-0C

Instruction Hours/week: L:1 T:0 P:0 **Marks: Internal:40 External:60 Total:100**

End Semester Exam:3 Hours

Course Objectives

The goal of this course is for students,

- 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.
- To discuss the methods employed in the production of alcohol from agricultural wastes / byproducts.
- To summarize the overall aspects involved in the production of paperboards and particleboards from agricultural wastes.

Course Outcomes

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

- Outline the types of agricultural wastes.
- Illustrate the collection and generation of value-added products from agricultural wastes
- Demonstrate the techniques involved in the production and utilization of biomass.
- Discuss the various parameters considered to be important in the designing of biogas units.
- Illustrate the various methods employed in the production of alcohol from the byproducts of agricultural wastes.
- Discuss the appropriate materials to produce paperboards and particleboards from agricultural wastes.

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 (thermochemical approach).

UNIT V – PRODUCTION OF PAPERBOARD AND PARTICLE BOARDS FROM AGRICULTURAL WASTE

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

SUGGESTED READINGS

1. Efthymia Alexopoulou. Bioenergy and Biomass from Industrial Crops on Marginal Lands. Elsevier, 1st Edition, 2020. (ISBN: 9780128188644).
2. Navanietha Krishnaraj Rathinam, Rajesh Sani. Biovalorisation of Wastes to Renewable chemicals and Biofuels. Elsevier, 1st Edition, 2019. (ISBN: 9780128179529).
3. Simona Ciuta, Demetra Tsiamis, Marco J. 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).

23BEEEOE01 RENEWABLE ENERGY RESOURCES 1H-0C

Instruction Hours/week: L:1 T:0 P:0 **Marks: Internal:40 External:60 Total:100**

End Semester Exam:3 Hours

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 powerplants 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 SOLAR ENERGY

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 WIND ENERGY

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 – Inter connected systems.

UNIT IV HYDRO ENERGY

Hydropower, classification of hydro power, Turbine selection, Ocean energy resources, ocean energy 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-conventional sources of energy Khanna publishers,2011
2. Khan.B.H, Non-Conventional Energy Resources, The McGraw 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.