Bachelor of Computer Applications (BCA)

Affiliated to Thiruvalluvar University

PROGRAMME HANDBOOK
CURRICULUM AND SYLLABUS UNDER CBCS
WITH EFFECT FROM 2023-2026

AUGUST 2023

DON BOSCO COLLEGE (CO-ED)

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PROGRAM OVERVIEW

Bachelor in Computer Application (BCA) is one of the most popular programs among the students who want to make their career in IT (Information Technology) field. The duration of the program is three years and divided into six semesters. It comprises subjects like database, networking, data structure, core programming languages like 'C', 'C++' and 'Java'. This program provides numerous opportunities to the students who are interested in the field of Computer Applications and desire to work in IT and/or IT enabled industries. It prepares students with the required knowledge to proceed for higher studies such as MCA, M.Sc. (IT), M.Sc. (Computer Science), MBA and likewise.

UNIVERSITY REGULATIONS - DEFINITIONS

PROGRAM - "Programme" means a course of study leading to the award of a degree in a discipline.

PROGRAM DURATION - It shall extend over a period of three years comprising six semesters with two semesters in one academic year.

COURSE - "Course" refers to a paper / practical / subject offered under the degree programme. Each Course is to be designed with lectures / tutorials/Laboratory or field work / seminar / practical training / Assignments / Term paper or Report writing etc., to meet effective teaching and learning needs.

CREDITS - The weightage given to each course of study (subject) by the experts of the Board of Studies concerned. The total minimum credits required for completing a UG program is 140.

CHOICE BASED - All Undergraduate Programs offered by Thiruvalluvar University are under Choice Based Credit System. This is to enhance the quality and mobility of the students within and between the Universities in the country and abroad.

ELIGIBILITY FOR ADMISSION - Candidate seeking admission to the first year of the UG Degree Course should have passed the Higher Secondary Course Examination (Academic or Vocational) Conducted by the Govt. of Tamil Nadu with Mathematics as a subject or any other Examination accepted as equivalent thereto by the Syndicate subject to such other conditions as may be prescribed.

PATTERN OF STUDY

The pattern of study for all UG Programs in Thiruvalluvar University consists of the following:

PART-I: Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.
The subject is offered during the **first two semesters** with one examination at the end of each semester (2 courses: 2 x 4 = 8 credits).

PART-II: English - The subject shall be offered during the **first two semesters** with one examination at the end of each semester (2 courses: 2 x 4 = 8 credits).

PART-III

(i) Core Subjects - Core papers including practicals wherever applicable are offered as prescribed in the scheme of examination, by the Board of Studies of respective subjects. There are 13 Core papers, 8 core practical papers, 4 allied and 3 electives constituting 80 credits for theory and 22 for practicals.

(ii) Allied Subjects - Allied papers including practicals wherever applicable are offered as prescribed in the scheme of Examination by the Boards of Studies of different subjects. There shall be 4 papers, **one each** in I, II, III and IV semester, for all UG Courses except for Science courses with practicals. For all the 4 semesters, the total number of credits for Allied courses shall be 20 only.

(iii) Electives Courses - Three elective courses with (3x3=) 9 credits are to be offered, one in the V Semester and two in the VI Semester. Elective subjects are selected from the list of electives prescribed by the Board of Studies concerned, as given below. Colleges can choose any one of the papers, given below, as an elective for a particular semester whether 5th semester or 6th semester. Elective paper for a particular semester once chosen by a particular college, should not be changed without getting prior permission and approval of the University.

PART-IV

i) Basic Tamil / Advanced Tamil (OR) Non-major Elective - Those who have not studied Tamil up to XII std and taken a non-Tamil language under Part-I shall take Tamil comprising two courses with 2 credits each (2x2=4 credits). The course content of which shall be equivalent to that prescribed for the 6th standard by the Board of Secondary Education and they shall be offered in the **third and fourth semesters**. (OR)
b. Those who have studied Tamil up to XII std and taken a non-Tamil language under Part-I shall take Advanced Tamil comprising two courses with 2 credits each (2x2=4 credits) in the **third and fourth semesters**. (OR) c. Others who do not come under the above a/b categories can choose the offered **non-major electives** consisting of two courses with (2x2=) 4 credits, in the **third and fourth semesters**.

ii) Skill Based Subjects All the UG Programs shall offer four courses of **skill based subjects one each** in III, IV, V & VI semester with 3 credits each (4x3= 12 credits) for which examination shall be conducted at the end of the respective semesters.

iii) Foundation Courses - There are 3 Foundation Courses offered.
1. Environmental Studies - offered in 1st Semester, under Part IV of the programme.
2.Value Education - offered in 2nd Semester under Part IV of the programme.
3.Soft Skill - offered in 2nd Semester under Part IV of the programme

(a) Environmental Studies - All UG Programs shall offer a course in Environmental Studies subject and it shall be offered in the **first semester as** one paper with 2 credits. Examination shall be conducted at the end of the first semester.

(b) Value Education - All UG Programs shall offer a course in "Value Education" and it shall be offered in the **second semester as** one paper with 2 credits. Examination shall be conducted at the end of second semester.

(c) Soft Skill - All the UG Programs shall offer a course in "Soft Skill" subject and it shall be offered in the **Second Semester by the Department of English**, as one paper with 1 credit. Examination shall be conducted at the end of the 2nd semester.

The assessment for the course in **Part IV,** namely (i)(a) alone, shall be only through CIA and not through external (University) examination for the total marks prescribed.
The assessment for the courses in **Part IV** namely (i)(b) & (i)(c) and (ii), (iii)(a), (iii)(b) and (iii)(c), shall be through CIA as well as external (University) examination for the total marks prescribed.

PART V
Extension Activities - Proper relevant records shall be maintained by the respective departments and if necessary it may be verified by the university authority at any time. The extension activities shall be conducted outside the regular working hours of the college. The mark sheet shall carry the gradation relevant to the marks awarded to the candidates. This grading shall be incorporated in the mark sheet to be issued at the end of the semester for which students shall pay the fee for one theory paper.
The marks shall be sent to the Controller of Examinations before the commencement of the final semester examinations.

Marks to be awarded as follows:
1. 20% of marks for Regularity of attendance.
2. 60% of marks for Active Participation in classes/camps/games/special Camps/Programmes in the college/ District / State/ University activities.
3. 10% of marks for Exemplary awards/Certificates/Prizes
4. 10% of marks for Other Social components such as Blood Donations, Fine Arts, etc

PASSING MINIMUM

1.A candidate shall be declared to have passed the whole examination, if the candidate passes in all the theory papers and practicals wherever prescribed as per the scheme of examinations by earning 140 credits in Part I, II, III, IV and V. He / She shall also fulfill the extension activity prescribed by earning 1 credit to qualify for the degree.

2.A candidate should get **not less than 40% in the University (external)** Examination, compulsorily, in any course of Part I, II, III & IV papers. Also the candidate who secures **not less than** 40% marks in the external as well as internal (CIA) examinations put together in any course of Part I, II, III & IV shall be declared to have successfully passed the examination in the subject in theory as well as practicals.

DISTRIBUTION

Table - 1(A): The following are the distribution of marks for external and internal for University (external) examination and continuous internal assessment and passing minimum marks for theory papers of UG Programs.

UNI. EXAM TOTAL (ESE)	PASSING MINIMUM FOR UNI.EXAM	CIA TOTAL	PASSING MINIMUM FOR CIA	TOTAL MARKS ALLOTTED	PASSING MINIMUM (UNI.EXAM+CIA)
75	30	25	0	100	40

Note: ESE - End Semester Examination

Table - 1(B): The following are the Distribution of marks for Continuous Internal Assessment in the theory papers of UG Programs.

S.No	For Theory - UG courses	Distribution of Marks	
		Assignments	Tests
1	Assignment-1 (First 2 Units of the Syllabus)	10	-
2	Test-1 (First 2 Units of the Syllabus for 1 Hour duration)	-	50
3	Assignment-2 (3rd& 4th Units of the Syllabus)	10	-
4	Test-2 (First 4 Units of the Syllabus for 2 Hours duration)	-	50
5	Assignment-2 (5th Unit of the Syllabus)	10	-
6	Test-3 (Entire Syllabus for 3 Hours duration)	-	100
	TOTAL MARKS	30	200
	Marks to be converted to	5	20
	Total Maximum Marks for CIA	25	

Table – 2(A): The following are the distribution of marks for University (external) examinations and continuous internal assessments and passing minimum marks for the **practical courses of UG Programs**.

UNI. EXAM TOTAL (ESE)	PASSING MINIMUM FOR UNI.EXAM	CIA TOTAL	PASSING MINIMUM FOR CIA	TOTAL MARKS ALLOTTED	PASSING MINIMUM (UNI.EXAM+CIA)
75	30	25	0	100	40

Table – 2(B): The following are the distribution of marks for the Continuous Internal Assessment in UG practical courses.

S.No.	For Practical - UG courses	Distribution of Marks	
		Assignments	**Tests**
1	Regular maintenance of the Observation note book-1 (Up to the end of I-Semester)	10	-
2	Test-1 (Up to the end of I-Semester for 2 Hours duration)	-	25
3	Regular maintenance of the Observation note book-2 (Up to the end of II-Semester)	10	
4	Test-2 (Up to the end of II-Semester for 2 Hours duration)	-	25
5	Regular maintenance & proper completion of the Record note book	10	-
6	Test-3 (Entire Syllabus following University examination pattern)	-	25
	TOTAL MARKS	30	75
	Marks to be converted to	10	15
	Total Maximum Marks for CIA	25	

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QUESTION PAPER PATTERN

The following question paper patterns shall be followed for CBCS pattern syllabi for the candidates admitted from the academic year 2017-2018 onwards.

External Maximum 75 Marks – wherever applicable (Ext.75 + Int.25 = Total. 100)

Section A	Very short answer questions	10X 2=20	10 questions – 2 from each unit
Section B	Short answer questions of either / or type (like 1a (or) 1b)	5X5=25	5 questions – 1 from each unit
Section C	Essay-type questions / Problem (Answer any 3 out of 5)	3X10=30	5 questions – 1 from each unit

NOTE: In Section "C" one of the questions shall be application oriented or a problem, wherever applicable.

GRADING

Once the marks of the CIA and end-semester examinations for each of the courses are available, they shall be added. The mark thus obtained shall then be converted to the relevant letter grade, grade point as per the details given below:

Conversion of Marks to Grade Points and Letter Grade (Performance in a Course/Paper)

RANGE OF MARKS	GRADE POINTS	LETTER GRADE	DESCRIPTION
90-100	9.0-10.0	O	Outstanding
80-89	8.0-8.9	D+	Distinction
75-79	7.5-7.9	D	
70-74	7.0-7.4	A+	First Class
60-69	6.0-6.9	A	
50-59	5.0-5.9	B	Second Class
40-49	4.0-4.9	C	Third Class
00-39	0.0	U	Re-appear
Absent	0.0	AAA	Absent

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PROGRAMME STRUCTURE

#	SEM	PART	CT	COURSE CATEGORY	HW	CR	CODE	TITLE
1	1	I	T	Language	6	4	23ULT10	Tamil I
2		II	T	English	6	4	23ULE10	General English I
3		III	T	Core	5	5	23UCA11	Python Programming
4		III	T	Foundation	2	2	23UFCA14	Structured Programming in C
5		III	T	Elective	3	4	23UECA13	Numerical Methods
6		III	P	Core	5	5	23UPCA15	Python Programming lab
7		IV	T	Skill	2	2	23USCA13	Fundamentals of Information Technology
8	2	I	T	Language	6	3	23ULT20	Tamil II
9		II	T	English	4	3	23ULE20	General English II
10		III	T	Naan Mudhalvan	2	2	23UNM20	Overview of English Communication
11		III	T	Core	5	5	23UCA21	Object Oriented Programming Concept Using C++
12		III	T	Allied	6	3	23UECA22B	Resource Management Techniques
13		IV	P	Core Practical	5	5	23UPCA25	Object Oriented Programming Concept Using C++ Lab
14		IV	T	SEC	2	2	23USCA23	Introduction To Html (Sec Ii)

15		IV	T	SEC	2	2	23USCA24	Understanding Internet
17	3	I	T	Language	6	3	FLT30	Tamil-III
18		II	T	English	6	3	FLE30	English-III
17		III	T	Core	5	5	FCA31	Data Structures and Algorithm
20		IV	T	NMD ***	3	2	FSCC30	Fundamentals of Coding and Cloud
21		III	P	Core	5	5	FPCA36	Data Structures and Algorithm Lab
22		III	T	SEC	7	3	FACM15C	Office Automation
23		IV	T	SEC	2	2		PHP Programming
24		IV	T	NME ***	1	1	FNEN34	Problem Solving Techniques
25	4	I	T	Language	6	3	FLT40	Tamil-IV
26		II	T	English	6	3	FLE40	English-IV
27		III	T	Core	5	5	FCA41	Java Programming
27		III	P	Core	5	5	FPCA46	Java Programming Lab
28		IV	T	NMD	4	2	FSOF40	Office Fundamentals
29		IV	T	SEC	2	2		Web Designing
30		IV	T	SEC	2	2		Cyber Forensics
31		III	T	NME	6	3	FNCA45	Network Security
32	5	III	T	Core	4	3	FCA 51	Operating System
33		III	P	Core	4	3	FCA 52	Operating System Lab
34		IV	T	Core	2	2	FCA 53	Value Education
3		III	T	Core	4	3	FPCA 56	Data Base Management System

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35		III	P	Core	4	3	FPCA 57	Data Base Management System Lab
36		III	T	Elective 1 ****	3	3	FECA 54A	Mobile Computing
							FECA 54B	Artificial Intelligence
							FECA 54C	Big Data Analytics
		III	T	Elective 1 ****	3	3		Computer Networks
								Software Testing
								Cryptography
					2	2		Value Education
		III	P	Project	5	4	FPCA 68	Group / Individual Project
		IV	P	Internship		2		Internship / Industrial Training
37		IV	T	NMD***	3	2	FSAM50	Foundations of AI&ML
38	6	III	T	Core	4	3	FCA 61	Machine Learning
39		III	T	Core	5	3	FCA 62	Data Analytics using R Programming
40		III	T	Elective2	5	3	FECA 63A	IOT and its Applications
							FECA 63B	Software Project Management
							FECA 63C	Enterprise Resource Planning
41		III	T	Elective3	5	3	FECA 64A	Natural Language Processing
							FECA 64B	Cloud Computing
							FECA 64C	Robotics and its Applications
42		IV	T	Skill	4	2	FECA 69C	Cyber Security
43		III	P	Core	4	2	FPCA 66	Machine Learning lab
44		III	P	Core	4	2	FPCA 67	Data Analytics using R Programming lab
45		IV	T	Skill	2	2		Open Source Technology
46		V	FW	Extension Activities	0	1	FEA 60	Extension Activities

INTERNAL MARK: 25   EXTERNAL MARK: 75   FOR EXTENSION ACTIVITIES: EXTERNAL MARK: 100

Note: T-Theory, P-Practical, FW-Field Work

Credit Distribution for UG Programmes

Sem I	Cred it	H	Sem II	Cred it	H	Sem III	Cred it	H	Sem IV	Cred it	H	Sem V	Cred it	H	Sem VI	Cred it	H
Part 1. Language – Tamil	3	6	Part. 1. Language – Tamil	3	6	Part. 1. Language – Tamil	3	6	Part. 1. Language – Tamil	3	6	5.1 Core Course – CC IX	4	5	6.1 Core Course – CC XIII	4	6
Part 2 English	3	6	Part 2 English	3	6	Part 2 English	3	6	Part 2 English	3	6	5.2 Core Course – CC X	4	5	6.2 Core Course – CC XIV	4	6
1.3 Core Course – CC I	5	6	2.3 Core Course – CC III	5	5	3.3 Core Course – CC V	5	5	4.3 Core Course – CC VII Core Industry Module	5	5	5.3 Core Course CC -XI	4	5	6.3 Core Course – CC XV	4	6
1.4 Core Course – CC II	5	5	2.4 Core Course – CC IV	5	5	3.4 Core Course – CC VI	5	5	4.4 Core Course – CC VIII	5	5	5.4 Core Course –/ Project with viva- voce CC -XII	4	5	6.4 Elective -VII Generic/ Discipline Specific	3	5
1.5 Elective I Generic/ Discipline Specific	3	5	2.5 Elective II Generic/ Discipline Specific	3	6	3.5 Elective III Generic/ Discipline Specific	3	5	4.5 Elective IV Generic/ Discipline Specific	3	6	5.5 Elective V Generic/ Discipline Specific	3	4	6.5 Elective VIII Generic/ Discipline Specific	3	5
1.6 Skill Enhanceme nt Course SEC-1	2	2	2.6 Skill Enhancem ent Course SEC-2	2	2	3.6 Skill Enhancemen t Course SEC-4 (Entrepreneu rial Skill)	1	1	4.6 Skill Enhancem ent Course SEC-6	2	2	5.6 Elective VI Generic/ Discipline Specific	3	4	6.6 Extension Activity	1	-
1.7 Skill Enhanceme nt (Foundatio nCourse)	2	2	2.7 Skill Enhanceme nt Course– SEC-3	2	2	3.7 Skill Enhanceine nt Course SEC-5	2	2	4.7 Skill Enhanceme nt Course SEC-7	2	2	5.7 Value Education	2	2	6.7 Professional Competenc y Skill	2	2
						3.8 E.V.S.	2	2				5.8 Summer Internship /Industrial Training	2				
	23	32		23	32		24	32		23	32		26	30		21	30

Total – 140 Credits

CREDIT DISTRIBUTION FOR U.G.

<table>
<tr><td colspan="4" align="center">3 – Year UG Programme
Credits Distribution</td></tr>
<tr><td></td><td></td><td>No. of Papers</td><td>Credits</td></tr>
<tr><td>Part I</td><td>Tamil(3 Credits)</td><td>4</td><td>12</td></tr>
<tr><td>Part II</td><td>English(3 Credits)</td><td>4</td><td>12</td></tr>
<tr><td>Part III</td><td>Core Courses (4 Credits)</td><td>15</td><td>60</td></tr>
<tr><td></td><td>Elective Courses :Generic / Discipline Specific (3 Credits)</td><td>8</td><td>24</td></tr>
<tr><td colspan="2"></td><td align="right">Total</td><td>108</td></tr>
<tr><td>Part IV</td><td>NME (2 Credits)</td><td>2</td><td>4</td></tr>
<tr><td></td><td>Ability Enhancement Compulsory Courses Soft Skill(2 Credits)</td><td>4</td><td>8</td></tr>
<tr><td></td><td>Skill Enhancement Courses (7 courses)
Entrepreneurial Skill -1
Professional Competency Skill Enhancement Course</td><td>1</td><td>13

2</td></tr>
<tr><td></td><td>EVS (2 Credits)</td><td>1</td><td>2</td></tr>
<tr><td></td><td>Value Education (2 Credits)</td><td>1</td><td>2</td></tr>
<tr><td colspan="3" align="right">Part IV Credits</td><td>31</td></tr>
<tr><td>Part V</td><td colspan="2">Extension Activity (NSS / NCC / Physical Education)</td><td>1</td></tr>
<tr><td colspan="3" align="center">Total Credits for the UG Programme</td><td>140</td></tr>
</table>

Consolidated Semester wise and Component wise Credit distribution

Parts	Sem I	Sem II	Sem III	Sem IV	Sem V	Sem VI	Total Credits
Part I	3	3	3	3	-	-	12
Part II	3	3	3	3	-	-	12
Part III	11	11	11	11	22	18	84
Part IV	6	6	6	7	3	3	31
Part V	-	-	-	-	-	1	1
Total	23	23	23	24	25	22	140

*Part I, II, and Part III components will be separately taken into account for CGPA calculation and classification for the under graduate programme and the other components. IV, V have to be completed during the duration of the programme as per the norms, to be eligible for obtaining the UG degree

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PROGRAM EDUCATION OBJECTIVES (PEO)

OB1: EDUCATION - The graduate will be able to continue higher studies in the field of Computer Science / Applications.

OB2: TECHNOLOGY - The graduate will be able to understand, analyze and develop software. applications and become skilled software professionals adopting cutting-edge technologies.

OB3: RESEARCH - The graduate will be able to be involved in research and development to propose computing models or solutions with innovation.

OB4: ETHICAL AND PROFESSIONAL GROWTH - The graduate will be able to articulate one's own value system and live by the values in life and in one's profession.

PROGRAM LEARNING OUTCOMES (PLO)

1. **Problem Solving:** Ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve problems related to Technology, Life and Career.

2. **Individual and Team work:** Ability to work effectively as a member and leader in a team, preferably in any setting.

3. **Communication Skills:** Ability to communicate within the profession and with society at large. Such abilities include reading, writing, speaking, listening, the ability to comprehend and write effective reports and documents.

4. **Professionalism:** Understand the professional ethics and apply the same for public and the public interest.

5. **Ethics and equity:** Ability to apply ethics, accountability, and equity in all dealings.

6. **Life-long learning:** Ability to identify and to address one's educational needs in the changing world in ways sufficient to maintain one's competence and to allow him/her to contribute to the advancement of selected domains.

PROGRAM SPECIFIC OUTCOMES (PSO)

1. **Knowledge of Computer systems**. Students can assess the hardware and software aspects of computer systems and connect the basic principles of its working.

2. **Application of mathematical principles:** Apply mathematical principles to solve real world problems using appropriate data structures and suitable algorithms.

3. **Programming:** Understand, analyze, design and develop *computer programs* using C, C++, Java and upcoming popular technologies.

4. **Software Engineering:** Apply process and life cycle of software engineering to develop software.

5. **Database Design:** Model and design the *database* for any computer system.

6. **Appreciation and Application of Emerging Technologies**: Analyze and appreciate emerging computing systems such as mobile, cloud, decision support, data mining, operating system, IoT, Networks, Information Security and related topics.

MAPPING OF INSTITUTION OBJECTIVES WITH PEOs

COLLEGE / PROGRAMME	EDUCATION	TECHNOLOGY	RESEARCH	ETHICAL AND PROFESSIONAL
OB1 : EDUCATION	√	√	√	√
OB2 : RESEARCH			√	
OB3 : EMPLOYABILITY		√	√	√
OB4 : COMM.SERVICE				√

MAPPING PEOs WITH POs / PSOs

PEO	PO1	PO2	PO3	PO4	PO5	PO6	PSO7	PSO8	PSO9	PSO10	PSO11	PSO12
1: EDUCATION	√	√	√		√	√	√	√	√	√	√	√
2: TECHNOLOGY	√				√	√		√			√	√
3: RESEARCH	√	√		√		√		√			√	√
4: ETHICAL AND PROFESSIONAL		√		√	√	√				√		√

MAPPING COURSE OUTCOMES WITH POs / PSOs

SEM	COURSE CODE	COURSE	PO1	PO2	PO3	PO4	PO5	PO6	PSO7	PSO8	PSO 9	PSO 10	PSO 11	PSO 12
1	23ULT10	TAMIL I	√	√	√	√	√	√						
	23ULE10	ENGLISH I	√	√	√	√	√	√						
	23UCA11	PYTHON PROGRAMMING	√	√	√	√	√	√						
	23UFCA14	STRUCTURED PROGRAMMING IN C	√	√	√	√	√	√	√	√	√		√	√
	23USCA13	FUNDAMENTALS OF INFORMATION TECHNOLOGY	√	√	√	√	√	√						
	23UECA12 B	NUMERICAL METHODS	√	√	√	√	√	√		√	√			√
	23UPCA15	PYTHON PROGRAMMING LAB	√	√	√	√	√	√	√	√	√		√	√
2	FLT20	TAMIL II	√	√	√	√	√	√						
	FLE20	GENERAL ENGLISH II	√	√	√	√	√	√						
	FCA21	Object Oriented Programming Concepts Using C++	√	√	√	√	√	√	√	√	√	√	√	√
	FSS20	Understanding Internet	√	√	√	√	√	√						
	FGA20	Introduction to HTML	√	√	√	√	√	√						
	FPCA23	Object Oriented Programming Concepts Using C++ Lab	√	√	√	√	√	√	√	√	√	√	√	√
	FAMA25B	Resource Management Techniques	√	√	√	√	√	√		√	√			√
	FEE20	OVERVIEW OF ENGLISH COMMUNICATION	√	√	√	√	√	√						
3	FLT30	TAMIL III	√	√	√	√	√	√						
	FLE30	GENERAL ENGLISH III	√	√	√	√	√	√						
	FCA31	Data Structures and Algorithm	√	√	√	√	√	√	√	√	√	√	√	√
	FSCC30	Office Automation	√	√	√	√	√	√		√	√		√	√
	FNEN34	Problem Solving Techniques	√	√	√	√	√	√						

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Sem	Code	Course	1	2	3	4	5	6	7	8	9	10	11	12
	FACM15C	PHP Programming	√	√	√	√	√	√					√	
	FPCA36	Data Structures and Algorithm Lab	√	√	√	√	√	√	√	√	√	√	√	√
	FPCA36	Environmental Studies	√	√	√	√	√	√						
4	FLT40	TAMIL IV	√	√	√	√	√	√						
	FLE40	GENERAL ENGLISH IV	√	√	√	√	√	√						
	FCA41	Java Programming	√	√	√	√	√	√			√	√	√	√
	FCA42	Cyber Forensics	√	√	√	√	√	√					√	√
	FCA43	Multimedia System	√	√	√	√	√	√				√	√	√
	FACM25C	Web Designing	√	√	√	√	√	√					√	√
	FPCA46	Java Programming Lab	√	√	√	√	√	√	√	√	√	√	√	√
	FSOF40	NM SUBJECT	√	√	√	√	√		√	√		√	√	√
5	FCA51	Data Base Management System	√	√	√	√	√	√				√	√	√
	FCA52	OPERATING SYSTEM	√	√	√	√	√	√	√	√	√	√	√	√
	FECA54A	Mobile Computing	√	√	√	√	√	√	√	√	√	√	√	√
	FECA54B	Artificial Intelligence	√	√	√	√	√	√	√	√	√	√	√	√
	FECA54C	Big Data Analytics	√	√	√	√	√	√	√	√	√	√	√	√
	FSAM50	Value Education	√	√	√	√	√	√					√	√
		Computer Networks	√	√	√	√	√	√	√	√	√	√	√	√
		Software Testing	√	√	√	√	√	√	√	√	√	√	√	√
		Cryptography	√	√	√	√	√	√	√	√	√	√	√	√
		Project with Viva voce	√	√	√	√	√	√					√	√
		Internship / Industrial Training	√	√	√	√	√	√					√	√
	FPCA56	Data Base Management System Lab	√	√	√	√	√	√	√	√	√	√	√	√
	FPCA57	OPERATING SYSTEM LAB	√	√	√	√	√	√	√	√	√	√	√	√
	FCA61	Machine Learning	√	√	√	√	√	√	√	√	√	√	√	√
	FCA62	Data Analytics using R Programming	√	√	√	√	√	√				√	√	√
	FECA63A	IOT and its Applications	√	√	√	√	√	√		√		√	√	√
	FECA63B	Software Project	√	√	√	√	√	√	√	√	√	√	√	√

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6														
		Management												
	FECA63C	Enterprise Resource Planning	√	√	√	√	√	√	√					√
	FECA64A	Natural Language Processing	√	√	√	√	√	√	√			√	√	√
	FECA64B	Cloud Computing	√	√	√	√	√	√	√			√	√	√
	FECA64C	Robotics and its Applications	√	√	√	√	√	√	√			√	√	√
	FECA69C	CYBER SECURITY	√	√	√	√	√	√		√	√	√	√	√
	FPCA66	Data Analytics using R Programming Lab	√	√	√	√	√	√	√	√	√	√	√	√
	FPCA67	Machine Learning Lab	√	√	√	√	√	√		√	√	√	√	√
	FPCA68	Open Source Technology	√	√	√	√	√	√	√	√	√	√	√	√
	FEA60	EXTENSION ACTIVITIES	√	√	√	√	√	√						

SEM I	LANGUAGE	Lecture	Practical	Credit
23ULT10	TAMIL I	6	0	3

Learning Objectives

• முதலொமொண்டுப் Hட்ட வகுப்பு மொணவர்களுக்குத் தமிழ் பமொலை இலக்கியங்கலை அறிமுகம் பெய்தல்

• தமிழ் இலக்கியப் வHொக்குகலையும், இலக்கணங்கலையும் மொணவர் அறியுமொறு பெய்து அவர்கைின் Hழடப்Hொற்றலத் தூண்டுதல்

• தமிழ் இலக்கியம் ொொர்ந்த வHொட்டித் வதர்வுகளுக்கு ஏற்H கற்Hித்தல் நழடமுழறகலை வமற்பகொள்ளுதல்

Expected Course Outcomes
On the Sucessful completion of the Course, Students will be able to
இப்Hொடத்ழதக் கற்Hதொல் Hின்வரும் Hயன்கலை மொணவர் அழடவர்

CO 1 ெங்க இலக்கியத்தில் கொணப்பHறும் வொழ்வியல் ொிந்தழனகலை அறிந்துபகொள்வர்   K4

CO 2 அற இலக்கியம் மற்றும் தமிழ் கொப்Hியங்கைின்வி வொழ்வியல் ொிந்தழனழயப் பHறுவர்   K5, K6

CO 3 Hக்தி இலக்கியங்கலைக் கற்Hதன் மூலம் Hக்தி பநறியிழனயும், Hகுத்தறிவு இலக்கியங்கலைக் கற்Hதன் வைி நல்லிணக்கத்ழதயும் பதெிந்து Hின்Hற்றுவர்   K3

CO 4 பமொலையறிவவொடு ொிந்தழனத்திறழனப் பHறுவர் K3

CO 5 பமொலைப்Hயிற்ொிக்குத் வதழவயொன இலக்கணங்கலைக் கற்Hர்.   K2

K1 - Remember; K2 - Undestand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

அலகு-1   தமிழ் இலக்கிய, இலக்கண வரலொறு அறிமுகம்.

1.   இலக்கணம்;
அ.Hதொல்கொப்Hியம், இழறயனொர் கைவியல் உழர , நம்Hியகப் பHொருள், புறப்பHொருள் பவண்Hொ மொழல, நன்னூல், தண்டியலங்கொரம், யொப்Hருங்கலக்கொொிழக- நூல்கள்

ஆ.பமொலைப் Hயிற்ொி- ஒற்றுப்Hிழை தவிர்த்தல்

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- வல்லினம் மிகும் இடங்கள்
- வல்லினம் மிகொ இடங்கள்
- ஈபரொொற்று வரும் இடங்கள்
- ஒரு, ஓர் வரும் இடங்கள்
- அது, அஃது வரும் இடங்கள்
- தொன், தொம் வரும் இடங்கள்

Hயிற்ொி : வல்லினம் மிகும் இடங்கள், மிகொ இடங்கள் தவறொக வரும்வழகயில் ஒரு Hத்தி பகொடுத்து ஒற்றுப் Hிழை திருத்தி எழுதச் பெய்தல்.

2. ொங்க இலக்கியம் - எட்டுத்பதொழக, Hத்துப்Hொட்டு

3. அற இலக்கியம்-Hதிபனண்கீழ்கணக்கு நூல்கள்

4. கொப்Hிய இலக்கியம் - ஐம்பஹருங் கொப்Hியங்கள், ஐஞ்ொிற ௞ கொப்Hியங்கள், மெயக் கொப்Hியங்கள்

5. Hக்தி இலக்கியமும் (Hன்னிரு திருமுழறகள், நொலொயிர திவ்வியப் HிரHந்தம் -- Hகுத்தறிவு இலக்கியமும் (ொித்தர் இலக்கியங்கள், புலவர் குைந்ழதயின் இரொவண கொவியம்)

அலகு-2   ொங்க இலக்கியம்

எட்டுத்பதொழக ;எ

1. நற்றிழண-முதல் Hொடல் -நின்ற பொல்லர்

2. குறுந்பதொழக 3 ஆம் Hொடல் -நிலத்தினும் பHொிவத

3. ஐங்குறுநூறு –பநல் Hல பHொலிக! பHொன் பHொிது ொிறக்க!' (முதல் Hொடல்)-வவட்ழகப் Hத்து

4. கலித்பதொழக- 51 - சுடர்ப்பதொடஇக் வகொய் -குறிஞ்ொிக் கலி

5. புறநொனூறு -189 பதண்கடல் வைவொகம் பHொதுழமயின்றி, நொடொ பகொன்வறொ -187

Hத்துப்Hொட்டு;

1. முல்ழலப்Hொட்டு (முழுவதும்)

அலகு-3   அற இலக்கியம்

1. திருக்குறள் -அறன் வலியுறுத்தல் அதிகொரம்

2. நொலடியொர்-Hொடல்: 131 (குஞ்ொியைகும்)

3. நொன்மணிக்கடிழக-நிலத்துக்கு அணியென்ப

4. Hைபமொழி நொனூறு- தம் நழட வநொக்கொர்

5.இனியழவ நொற்Hது- 37. ஐிழமமழய மூப்பு என்று

அலகு-4   கொப்Hிய இலக்கியம்

1. ொிலப்Hதிகொரம் – வைக்குழரகொழத

2. மணிவமகழல- Hொத்திரம் பHற்ற கொழத

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3.	பHொியபுரௌணம் - பூொலொர் நொயனொர்புரௌணம்

4.	கம்Hரௌமொயணம்- குகப் Hடலம்

5.	ீறொப்புரௌணம் – மொனுக்குப் Hிழண நின்ற Hடலம்

6.	இவயசு கொவியம் -ஊதொொிப்Hிள்ழை

அலகு-5	Hக்தி இலக்கியமும், Hகுத்தறிவு இலக்கியமும்

Hக்தி இலக்கியம்;

1.	திருநொவுக்கரெர் வதவொரம் - நொமொர்க்கும் குடியல்வலம் எனத் பதொடங்கும் Hொடல் மட்டும்

2.	மொணிக்கவொெகர் திருவொெகம் - நமச்ிவொய வொஅழ்க நொதன்தொள் வொழ்க முதல் ிரம்குவிவொர் ஓங்குவிக்கும் ீவெரொன் கைல் பவல்க வழர

3.	பHொய்ழகயொழ்வொர்-ழவயந் தகைியொ வொர்கடவல

4.	பூதத்தொழ்வொர்-அன்வH தகைியொ

5.	வHயொழ்வொர்-திருக்கண்வடன் பHொன்வமனி கண்வடன்

6.	ஆண்டொள் – திருப்Hொழவ மொர்கைித் திங்கள் (முதல் Hடல்)

Hகுத்தறிவு இலக்கியம்;

•	திருமூலர் – திருமந்திரம் (270,271, 274, 275 285)

•	Hட்டினத்தொர் -திருவிழட மருதூர் (கொவட தெிரிந்து – எனத் பதொடங்கும் Hொடல் Hொ.எண ;.279, 280)

•	கடுபவி ைித்தர் - Hொ Hஞ்பெய் யொதிரு மனவம (Hொடல் முழுவதும்)

•	இரொவண கொவியம் – தொய்பமொழைிப் Hடலம் - 18. ஏடுழக யில்லொ ொில்ழல முதல் - 22. பெந்தமிழ் வைர்த்தொர். வரை

Text books

•	.

Reference Books

•	மு. வரதரொென், தமிழ் இலக்கிய வரலொறு, ொகித்ய அக்கொபதமி, புதுபடல்லி.

•	மது. ெ. விமலொனந்தன், தமிழ் இலக்கிய வரலொறு, மீனொட்ி புத்தக நிழலயம், மதுழர.

•	தமிஅண்ணல், புதிய வநொக்கில் தமிழ் இலக்கிய வரலொறு, மீனொட்ி புத்தக நிழலயம், மதுழர.

•	தமிழ் இலக்கிய வரலொறு –முழனவர்.ிற்Hி Hொலசுப்ரமணியம், முழனவர்.பொ.வெதுHதி

•	புதிய தமிழ் இலக்கிய வரலொறு– முழனவர்.ிற்Hி Hொலசுப்ரமணியம்,நீல.Hத்மநொHன்

- தமிழ் இலக்கிய வரலொறு - டொக்டர்.அ.கொ.பHருமொள்
- தமிழ் இலக்கிய வரலொறு –முழனவர். H.ெ.ஏசுதொென்
- தமிழ் இலக்கிய வரலொறு – ஸ்ரீ குமொர்
- வழகழம வநொக்கில் தமிழ் இலக்கிய வரலொறு–Hொக்கியவமெரி
- தமிழ் Hயிற்றும் முழற, வHரொெிெொியர் ந. சுப்புபரட்டியொர் - மணிவொெகர் Hதிப்Hகம், ெிதம்Hரம்

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

Web Sources

- https://www.chennailibrary.com/
- https://www.sirukathaigal.com
- https://www.tamilvirtualuniversity.org
- https://www.noolulagam.com
- https://www.katuraitamilblogspot.com

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
CLO1	3	2	3	3	3	2	2	2	3	2	3	2
CLO2	3	3	2	2	2	3	2	3	3	2	2	2
CLO3	3	2	3	3	2	2	2	3	2	3	3	2
CLO4		3	3	2	2	2	3	2	3	2	3	3
CLO5	3	3	2	2	2	3	3	2	2	2	3	3

Strong -3,Medium-2,Low-1

SEM I	ENGLISH	Lecture	Practical	Credit
	GENERAL ENGLISH I	6	0	3

Subject Code	Category	L	T	P	S	Credits	Inst. Hours	Marks		
								CIA	External	Total
	Part II	Y	Y	-	-	3	6	25	75	100

	Learning Objectives
LO1	To enable learners to acquire self-awareness and positive thinking required in various life situations.
LO2	To help them acquire the attribute of empathy
LO3	To assist them in acquiring creative and critical thinking abilities
LO4	To enable them to learn the basic grammar
LO5	To assist them in developing LSRW skills

Unit No.	Unit Title & Text	No. of Periods for the Unit
I	**SELF-AWARENESS(WHO)&POSITIVE THINKING(UNICEF)** **Life Story** 1.1 Chapter 1 from MalalaYousafzai, I am Malala 1.2 An Autobiography or The Story of My Experiments with Truth (Chapters 1, 2 & 3) M.K.Gandhi **Poem** 1.3 Where the Mind is Without Fear – Gitanjali 35 – Rabindranath Tagore 1.4 Love Cycle – Chinua Achebe	20
II	**EMPATHY** **Poem** 2.1 **Nine Gold Medals – David Roth** 2.2 **Alice Fell or poverty – William Wordsworth** **Short Story** 2.3 **The School for Sympathy – E.V. Lucas** 2.4 **Barn Burning – William Faulkner**	20

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III	**CRITICAL & CREATIVE THINKING** **Poem** 3.1 The Things That Haven't Been Done Before – Edgar Guest 3.2 Stopping by the Woods on a Snowy Evening – Robert Frost **Readers Theatre** 3.3 The Magic Brocade – A Tale of China 3.4 Stories on Stage – Aaron Shepard (Three Sideway Stories from Wayside School" by Louis Sachar)	20

IV	**Part of Speech** 4.1 Articles 4.2 Noun 4.3 Pronoun 4.4 Verb 4.5 Adverb 4.6 Adjective 4.7 Preposition	15
V	**Paragraph and Essay Writing** 5.1 Descriptive 5.2 Expository 5.3 Persuasive 5.4 Narrative **Reading Comprehension**	15

Course Outcomes		
Course Outcomes	On completion of this course, students will:	
CO1	Acquire self-awareness and positive thinking required in various life situations	PO1,PO7
CO2	Acquire the attribute of empathy.	PO1,PO2,PO10
CO3	Acquire creative and critical thinking abilities.	PO4,PO6,PO9
CO4	Learn basic grammar	PO4,PO5,PO6
CO5	Development and integrate the use of four language skills i.e., listening, speaking, reading and writing.	PO3,PO8

Web Resources	
1	MalalaYousafzai. I am Malala (Chapter 1) https://archive.org/details/i-am-malala

2	M.K Gandhi. An Autobiography or The Story of My Experiments with Truth(Chapter-1)-
	Rupa Publication, 2011 https://www.indiastudychannel.com/resources/146521-Book-Review-An-Autobiography-or-The-story-of-my-experiments-with-Truth.aspx
3	Rabindranath Tagore. "Gitanjali 35" from Gitanjali (Song Offerings)https://www.poetryfoundation.org/poems/45668/gitanjali-35
4	Aaron Shepard.Stories on Stage, Shepard Publications, 2017
	https://amzn.eu/d/9rVzlNv
5	J C Nesfield. Manual of English Grammar and Composition.
	https://archive.org/details/in.ernet.dli.2015.44179

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	3	2
CO2	2	3	3	3	2	3	3	2	2	2
CO3	3	3	3	2	3	3	3	2	3	2
CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	2	3	3	3	3	3	2	2	3

Mapping with Programme Specific Outcomes:

CO /PO	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3
CO2	3	3	3	3
CO3	3	3	3	3
CO4	3	3	3	3
CO5	3	3	3	3
Weightage	15	15	15	15
Weighted percentage of Course Contribution to POS	3.0	3.0	3.0	3.0

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SEM I	ELECTIVE I	Lecture	Practical	Credit
23UECA12B	**NUMERICAL METHODS**	**2**	**0**	**2**

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	NUMERICAL METHODS	Elective	4	-	-	-	3	4	25	75	100

Learning Objective	
LO1	To solve practical technical problems using various numerical method formulas
LO2	To derive appropriate numerical methods to solve algebraic, transcendental equations.
LO3	To know the numerical methods of solving simultaneous linear equations.
LO4	To acquire knowledge about forward differences and Backward differences and their relationship.
LO5	Knowledge about central difference operators and problems based on various central differences formulae.

UNIT	Contents	No. of Hours
I	**Curve Fitting- Principle of Least square** Fitting of straight line $Y = a x + b$, parabola $Y = a x^2 + b x + c$, exponential curves of forms $Y = a x^b, Y = a e^{bx}$, and $Y = a b^x$.	12

UNIT	Contents	No. of Hours
II	**The solution of numerical algebraic and transcendental Equations:** Bisection method – Iteration Method – Regula Falsi Method – Newton – Raphson method	12

UNIT	Contents	No. of Hours
III	**Solution of simultaneous linear algebraic equations:** Gauss elimination method – Gauss Jordan method – Method of Triangularization –Gauss Jacobi method – Gauss Seidel method	12

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IV	**Finite differences**	12
	Operators Δ, ∇ and E - relation between them — factorial polynomials. **Interpolation with equal intervals:** Gregory-Newton forward and backward interpolation formulas.	

V	**Central differences formulae**	12
	Operators $\Box$, ð and relation with the other operators. Gauss forward and backward formulae, Stirling's formula and Bessel's formula	
	Total	60

	Course Outcomes	Programme Outcome
CO	Upon completion of the course the students would be Able to:	
1	Solve the problems of fitting of straight lines, parabolas and the different form of exponential curves	PO1
2	Solve algebraic equations using various methods like Bisection method, Iteration method, Regula Falsi method and Newton – Raphson method	PO1, PO2
3	Estimate the solution of simultaneous linear equations using different numerical methds	PO3, PO5
4	Define basic concept of operators Δ, A$\Box\Box\Box\Box$, Solving interpolation with equal intervals problems using Gregory Newton"s forward formula and Newton"s backward formula	PO5
5	Estimate the solution of central difference formula using the methods Gauss's forward, backward formula, Stirling's formula and Bessel,s formula	PO3, PO6

Text Book
Kandasamy. P, Thilagavathi. K and Gunavathi. K "Numerical methods" – S. Chandand Company Ltd, New Delhi – Revised Edition 2007. (Chapters:1,3,4,5,6, and 7).

Reference Books
Venkataraman M. K.,"Numerical Methods in Science and Engineering" NationalPublishing company V Edition 1999.
Sankara Rao K., "Numerical Methods for Scientists and Engineers" 2nd Edition PrenticeHall India 2004

Web Resources
https://nptel.ac.in/courses/111107105

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Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO 2	PSO3	PSO4	PSO 5	PSO6
CO 1	3	3	3	3	3	3
CO 2	3	3	2	3	3	3
CO 3	3	2	2	3	2	3
CO 4	3	3	3	2	2	3
CO 5	3	2	3	2	3	2
Weight age of course contributed to each PSO	15	13	13	13	13	14

S-Strong-3   M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	CIA	External	Total
			5	-	-	-	5	25	75	100
CC1	**Python Programming**									

Learning Objectives

LO1	To make students understand the concepts of Python programming.
LO2	To apply the OOPs concept in PYTHON programming.
LO3	To impart knowledge on demand and supply concepts
LO4	To make the students learn best practices in PYTHON programming
LO5	To know the costs and profit maximization

UNIT	Contents	No. of Hours
I	**Basics of Python Programming:** History of Python-Features of Python-Literal-Constants-Variables - Identifiers–Keywords-Built-in Data Types-Output Statements – Input Statements-Comments – Indentation- Operators-Expressions-Type conversions. **Python Arrays:** Defining and Processing Arrays – Array methods.	15
II	**Control Statements:** Selection/Conditional Branching statements: if, if-else, nested if and if-elif-else statements. Iterative Statements: while loop, for loop, else suite in loop and nested loops. **Jump Statements:** break, continue and pass statements**.**	15
III	**Functions:** Function Definition – Function Call – Variable Scope and its Lifetime-Return Statement. **Function Arguments**: Required Arguments, Keyword Arguments, Default Arguments and Variable Length Arguments-Recursion. **Python Strings:** String operations- Immutable Strings - Built-in String Methods and Functions - String Comparison. **Modules**: import statement- The Python module – dir() function – Modules and Namespace – Defining our own modules	15
IV	**Lists:** Creating a list -Access values in List-Updating values in Lists-Nested lists -Basic list operations-List Methods. Tuples: Creating, Accessing, Updating and Deleting Elements in a tuple – Nested tuples– Difference between lists and tuples. **Dictionaries:** Creating, Accessing, Updating and Deleting Elements in a Dictionary – Dictionary Functions and Methods - Difference between Lists and Dictionaries.	15
V	**Python File Handling:** Types of files in Python - Opening and Closing files- Reading and Writing files: write() and writelines() methods- append() method – read() and readlines() methods – with keyword – Splitting words – File methods - File Positions- Renaming and deleting files.	15

Course Outcomes		Programme Outcomes
	TOTALHOURS	**75**

	Course Outcomes	Programme Outc omes
CO	On completion of this course, students will	
CO1	Learn the basics of python, Do simple programs on python, Learn how to use an array.	PO1,PO2,PO3, PO4,PO5,PO6
CO2	Develop program using selection statement, Work with Looping and jump statements, Do programs on Loops and jump statements.	PO1,PO2,PO3, PO4,PO5,PO6
CO3	Concept of function, function arguments, Implementing the concept strings in various application, Significance of Modules, Work with functions, Strings and modules.	PO1,PO2,PO3, PO4,PO5,PO6
CO4	Work with List, tuples and dictionary, Write program using list, tuples and dictionary.	PO1,PO2,PO3, PO4,PO5,PO6
CO5	Usage of File handlings in python, Concept of reading and writing files, Do programs using files.	PO1,PO2,PO3, PO4,PO5,PO6

	Textbooks
1	ReemaThareja,―PythonProgrammingusingproblemsolvingapproach,FirstEdition, 2017,Oxford University Press.
2	Dr.R.NageswaraRao,―CorePythonProgramming ,FirstEdition,2017,Dreamtech Publishers.

	Reference Books
1.	VamsiKurama, "Python Programming: A Modern Approach", Pearson Education.
2.	Mark Lutz, "Learning Python", Orielly.
3.	Adam Stewarts, "Python Programming", Online.
4.	Fabio Nelli, "Python Data Analytics", APress.
5.	KennethA. Lambert,―Fundamentals of Python–First Programs,CENGAGE Publication.

	WebResources
1.	https://www.programiz.com/python-programming

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2.	https://www.guru99.com/python-tutorials.html
3.	https://www.w3schools.com/python/python_intro.asp
4.	https://www.geeksforgeeks.org/python-programming-language/
5.	https://en.wikipedia.org/wiki/Python_(programming_language)

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	2	2	3	3	3
CO 2	3	2	2	3	2	3
CO 3	3	2	2	3	2	2
CO 4	3	2	2	3	2	3
CO 5	3	2	2	3	3	3
Weightage of course contributed to each PSO	15	10	10	15	13	14

S-Strong-3   M-Medium-2 L-Low-

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Subject Code	Subject Name	Category	L	T	P	S	Credits	CIA	External	Total
									Marks	
CC2	**Python Lab**		-	-	4	-	4	25	75	100

Course Objectives:

1. Be able to design and program Python applications.
2. Be able to create loops and decision statements in Python.
3. Be able to work with functions and pass arguments in Python.
4. Be able to build and package Python modules for reusability.
5. Be able to read and write files in Python.

LAB EXERCISES	Required Hours
1. Program using variables, constants, I/O statements in Python. 2. Program using Operators in Python. 3. Program using Conditional Statements. 4. Program using Loops. 5. Program using Jump Statements. 6. Program using Functions. 7. Program using Recursion. 8. Program using Arrays. 9. Program using Strings. 10. Program using Modules. 11. Program using Lists. 12. Program using Tuples. 13. Program using Dictionaries. 14. Program for File Handling.	**60**

Course Outcomes	
On completion of this course, students will	
CO1	Demonstrate the understanding of syntax and semantics of
CO2	Identify the problem and solve using PYTHON programming techniques.
CO3	Identify suitable programming constructs for problem solving.

CO4	Analyze various concepts of PYTHON language to solve the problem in an efficient way.
CO5	Develop a PYTHON program for a given problem and test for its correctness.

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	2	2	2	2	3	2
CO 2	2	1	3	2	-	2
CO 3	3	3	1	1	1	2
CO 4	2	3	3	1	-	1
CO 5	3	2	3	1	1	-
Weightage of course contributed to each PSO	12	11	12	7	5	7

S-Strong-3   M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	CIA	External	Total
								Marks		
	FUNDAMENTALSOF INFORMATION TECHNOLOGY	Specific Elective	2	-	-	-	2	25	75	100

<table>
<tr><td colspan="3" align="center">Learning Objectives</td></tr>
<tr><td>LO1</td><td colspan="2">Understand basic concepts and terminology of information technology.</td></tr>
<tr><td>LO2</td><td colspan="2">Have a basic understanding of personal computers and their operation</td></tr>
<tr><td>LO3</td><td colspan="2">Be able to identify data storage and its usage</td></tr>
<tr><td>LO4</td><td colspan="2">Get great knowledge of software and its functionalities</td></tr>
<tr><td>LO5</td><td colspan="2">Understand about operating system and their uses</td></tr>
</table>

UNIT	Contents	No.Of. Hour s
I	**Introduction to Computers** - Generations of Computer – Data and Information – Components of Computer – Software – Hardware – Input Devices - Output Devices — Types of Operating System.	**6**
II	**MS Word**: Introduction – Elements of Window – Files, Folders an Directorie – Text Manipulating: Cut, Copy, Paste, Drag and Drop – Tex Formatting: Fon – Style, Size, Face and Colors (Both foreground an background) – Alignment Bullets and Numbering - Header and footer watermark – inserting object (images, other application document) – Tabl creation – Mail merge.	**6**
III	**Ms Excel**: Introduction – Inserting rows and columns – Sizing rows and columns – Implementing formulas – Generating series - Functions in excel – Creation of Chart – Inserting objects – Filter – Sorting – Inserting worksheet.	**6**
IV	**MS PowerPoint**: Introduction – Slides Manipulation (Inserting new, Copy, paste, delete and duplicate slides) – Slide show– Types of Views – Types of Animations – Inserting Objects – Implementing multimedia (Video and Audio) – Templates (Built-in and User-Defined).	**6**

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V	**Internet**: Introduction to Internet and Intranet – Services of Internet - Domain Name – URL – Browser – Types of Browsers – Search Engine - E- Mail – Basic Components of E-Mail –.How to send group mail. **E- Commerce**: Digital Signature – Digital Currency – Online shopping and transaction	6
	TOTALHOURS	**30**

	Course Outcomes	**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Learn the basics of computer, Construct the structure of the required things in computer, learn how to use it.	PO1, PO2, PO3,PO4,PO5, PO6
CO2	Develop organizational structure using for the devices present currently under input or output unit.	PO1, PO2, PO3,PO4,PO5, PO6
CO3	Concept of storing data in computer using two header namely RAM and ROM with different types of ROM with advancement in storage basis.	PO1, PO2, PO3,PO4,PO5, PO6
CO4	Work with different software, Write program in the software and applications of software.	PO1, PO2, PO3,PO4,PO5,PO6
CO5	Usage of Operating system in information technology which really acts as a interpreter between software and hardware.	PO1,PO2,PO3, PO4,PO5,PO 6

	Textbooks
1	Anoop Mathew, S. Kavitha Murugeshan (2009), " Fundamental of Information Technology", Majestic Books.
2	Alexis Leon, Mathews Leon," Fundamental of Information Technology", 2nd Edition.
3	S. K Bansal, "Fundamental of Information Technology".

	Reference Books
1.	Bhardwaj Sushil Puneet Kumar, "Fundamental of Information Technology"

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2.	GG WILKINSON, "Fundamentals of Information Technology", Wiley-Blackwell
3.	A Ravichandran , "Fundamentals of Information Technology", Khanna Book Publishing
	Web Resources
1.	https://testbook.com/learn/computer-fundamentals
2.	https://www.tutorialsmate.com/2020/04/computer-fundamentals-tutorial.html
3.	https://www.javatpoint.com/computer-fundamentals-tutorial
4.	https://www.tutorialspoint.com/computer_fundamentals/index.htm
5.	https://www.nios.ac.in/media/documents/sec229new/Lesson1.pdf

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	2	3	2	2	1	1
CO 2	3	2	3	2	3	3
CO 3	3	2	2	2	2	3
CO 4	2	3	3	3	3	1
CO 5	3	3	3	3	3	2
Weightage of course contributed to each PSO	13	13	13	12	12	10

 S-Strong-3   M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	CIA	External	Total
									Marks		
FC	**Structured Programming Language in C**	FC	2	-	-	-	2	2	25	75	100

	Course Objective										
LO1	To familiarize the students with the Programming basics and the fundamentals of C, Datatypes in C, Mathematical and logical operations.										
LO2	To understand the concept using if statements and loops										
LO3	This unit covers the concept of Arrays										
LO4	This unit covers the concept of Functions										
LO5	To understand the concept of implementing pointers.										

UNIT	Details	No. of Hour	Course Objective

I	**Overview of C**: Importance of C, sample C program, C program structure, executing C program. Constants, Variables, and Data Types: Character set, C tokens, keywords and identifiers, constants, variables, data types, declaration of variables, Assigning values to variables---Assignment statement, declaring a variable as constant, as volatile. Operators and Expression.	6	CO1
II	**Decision Making and Branching**: Decision making with If, simple IF, IF ELSE, nested IF ELSE , ELSE IF ladder, switch, GOTO statement.**Decision Making and Looping**: While, Do-While, For, Jumps in loops.	6	CO2
III	**Arrays**: Declaration and accessing of one & two-dimensional arrays, initializing two-dimensional arrays, multidimensional arrays.	6	CO3

IV	**Functions**: The form of C functions, Return values and types, calling a function, categories of functions, Nested functions, Recursion, functions with arrays, call by value, call by reference, storage classes-character arrays and string functions		6	CO4
V	**Pointers:** definition, declaring and initializing pointers, accessing a variable through address and through pointer, pointer expressions, pointer increments and scale factor, pointers and arrays, pointers and functions, pointers and structures.		6	CO5
	Total			**30**

Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
1	Remember the program structure of C with its syntax and semantics	PO1,PO3,PO5
2	Understand the programming principles in C (data types, operators, branching and looping, arrays, functions, structures, pointers and files)	PO2,PO3,PO6,PO7
3	Apply the programming principles learnt in real-time problems	PO3,PO4,PO7
4	Analyze the various methods of solving a problem and choose the best method	PO4,PO5,PO6

5	Code, debug and test the programs with appropriate test Cases	PO7,PO8
Text Book		
1	E.Balagurusamy,ProgramminginANSIC,FifthEdition,TataMcGraw-Hill,2010.	
Reference Books		
1.	Byron Gottfried, Schaum's Outline Programming with C, Fourth Edition, Tata McGraw-Hill, 2018.	
2.	Kernighan and Ritchie, The C Programming Language, Second Edition, Prentice Hall, 1998	
3.	P.Rizwan Ahmed, Programming in C (ANSI), Margham Publications, 2020	

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Web Resources	
1.	https://codeforwin.org/
2.	https://www.geeksforgeeks.org/c-programming-language/
3.	http://en.cppreference.com/w/c
4.	http://learn-c.org/
5.	https://www.cprogramming.com/

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	2	2	2	2	-
CO2	2	2	2	2	-	2
CO3	3	2	2	1	1	-
CO4	3	2	2	1	-	1
CO5	1	2	2	2	2	3
Weightage of course contributed to each PSO	7	10	10	18	15	6

S-Strong-3 M-Medium-2 L-Low-1

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SEM II	LANGUAGE	Lecture	Practical	Credit
	TAMIL II	6	0	3

Course Code	Course Name	category		L	T	P	S	Credits	Ins.Hrs	CIA	Externa	Total
	பH�𑇢ொதுத்தமிழ் -2	Supportive		-	-	-	3	6	25	75	100	
	தமிழ் இலக்கிய வரலொறு -2		Y									
Pre-Requisite		Hன்னிபரண்டொம் வகுப்Hஙில் தமிழை ஒரு Hஒடமொகப் Hயின்றிருக்க வவண்டும்						SV 2023				

Learning Objectives

•   முதலொமொண்டுப் Hட்ட வகுப்பு மொணவர்களுக்குத் தமிழ் பமொஙை இலக்கியங்கழை அறிமுகம் பெய்தல்

•   தமிழ் இலக்கியப் வHொக்குகழையும், இலக்கணங்கழையும் மொணவர் அறியுமொறு பெய்து அவர்ஙைகின் Hழடப்Hொற்றழலத் தூண்டுதல்

•   தமிழ் இலக்கியம் ஒஒர்ந்த வHொட்டித் வதர்வுகளுக்கு ஏற்H கற்H�𑇢ித்தல் நழடமுழறகழை வமற்பகொள்ளுதல்

Expected Course Outcomes

On the Sucessful completion of the Course, Students will be able to

இப்Hொடத்ழதக் கற்Hதொல் Hஙின்வரும் Hயன்கழை மொணவர் அழடவர்

CO 1   ஒஙிற்றிலக்கியங்கஙின்வி இலக்கியச் சுழவயிழனயும் Hண்Hஒட்டு அறிவிழனயும் பHறுவர்   **K4**

CO 2   புதுக்கவிழத வரலொற்றிழன அறிந்து பகொள்வர்   **K5, K6**

CO 3   திரொவிட இயக்க இலக்கியங்கழைக் கற்Hதன் மூலம் பமொஙை உணர்வு , இன உணர்வு, மெத்துவம் ஒஒர்ந்த ஒிந்தழனகழைப் பHறுவர்   **K3**

CO 4   தமிழ்பமொஙைழயப் Hஙிழையின்றி எழுதவும், புதிய கழலச்பொற்கழை

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உருவொக்கவும் அறிந்து பகொள்வர்   K3

CO 5   வஹொட்டித் வதர்வுகெில் பவற்றி பஹறுவதற்குத் தமிழ்ப் Hொடத்திழனப்
Hயன்பகொள்ளும் வழகயில் Hயிற்ெி0 பHறுவர்.   K2

K1 - Remember; K2 - Undestand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

அலகு-1   தமிழ் இலக்கிய வரலொறு அறிமுகம்.

1.   ொெிற்றிலக்கியம்; குறவஞ்ொி, கலம்Hகம், உலொ, Hரணி, Hள்ளு, Hெிள்ளைத்தமிழ், தூது, அந்தொதி.

2.   தனிப்Hொடல் அறிமுகம்

3.   இக்கொல இலக்கியம் ;கவிழத, ொிறுகழத,நொடகம், உழரநழட. , திரௌவிட இயக்கம் வைர்த்த தமிழ்.

அலகு-2   ொெிற்றிலக்கியக்கமும்,தனிப்Hொடலும்

ொெிற்றிலக்கியம்;

•   கலிங்கத்து Hரணி- விருந்தினரும் வறியவரு பநருங்கி யுண்ணரும் - முதல் - வகட்Hொழரக் கொண்மின் கொண்மின் - வழர

•   திருக்குற்றொலக் குறவஞ்ொி - வானரங்கள் கனியகாடுத்து

•   முக்கூடற் Hள்ளு - ஆற்று பவள்ளமை நொழை வரத்

•   அHெிரொமி அந்தொதி- கழலயொத கல்வியும் குழறயொத வயதும (Hதினொற ௫ பெல்வங்கள்)

•   திருவரங்கக் கலம்Hகம் – மறம் -Hெிள்ளைப் பHருமொள் ஐயங்கொர்-வHெவந்த தூத பெல்லெரித்த ஓழல பெல்லுவமொ

•   தமிழ்விடு தூது முதல் Hத்து கண்ணிகள் தனிப்Hொடல்;

•   வொன்குருவி யின்கூடு -ஔழவயொர்

•   ஆமணக்குக்கும் யொழனக்கும் ொிவலழட ;முத்திருக்கும் பகொம்Hழக்கும் ழொரித்தண்வட -

கொழைவமகப் புலவர்

•   இம்Hர் வொன் எல்ழல இரொமழனவய Hொடி -வீரரொகவர்

•   நொரொய் நொரொய் -ொத்தி முத்தப் புலவர்

அலகு-3   இக்கொல இலக்கியம்- 1

1.   Hொரதியொர் Hொரத ொெுமுதொயம் வொழ்கவவ

2.   Hொரதிதொென் - ொிறுத்ழதவய பவையில் வொ

3.   நொமக்கல் கவிஞர்-கத்தியின்றி

4.   தமிழ் ஞொி – மீன்கள் (அந்தி நிலொ Hொர்க்க வொ)

5.   ஈவரொடு தமிஎன்Hன் – எட்டொவது ொீர் (வணக்கம் வள்ளுவ)

ொிறுகழதகள்;_

1.   புதுழமப்Hித்தன் - கடிதம்

2.   பெயகொந்தன் -வொய்ச் பொற்கள் (மொழல மயக்கம் பதொகுப்பு)

3.   ஆர். சூடொமணி - அந்நியர்கள் உழரநழட ;

1.   மு வ கடிதங்கள் - தம்Hிக்கு நூலில் முதல் இரண்டு கடிதங்கள்

அலகு-4   இக்கொல இலக்கியம்- 2

1.   தந்ழத பHௌௌியொர் – திருக்குறள்(மொநொட்டு) உ�ழர

2.   வHரறிஞர் அண்ணொ – இரண்டொம் உலகத் தமிழ் மொநொட்டு உ�ழர

3.   கழலஞர் மு. கருணொநிதி – பதொல்கொப்Hௌிய பூங்கொ –எழுத்து -முதல் நூற்Hௌ கட்டு�ழர நொடகம் / திழரத்தமிழ் :

1.   வவழலக்கொௌௌி –திழரப்Hடம்

2. ரொஸௌௌ ரொணீ -ௌௌொக்ரஈஸ் -ஓரங்க நொடகம் இதியல் தமிழ் ;

முரபொலி கடிதம்

1. பெம்பமொணௌௌி வரலொற்றில் ௌௌில பெப்வHடுகள்

அலகு-5   பமொணௌௌிப் Hயிற்ௌௌி

பௌொல ௦ வவறுHௌௌட ௨ / Hௌிழ தவிர்த்தல்

•   வொௌௌிப்Hது – வொௌௌிப்Hவர்

•   சுவர்- சுவெரில்

•   வயிறு - வயிற்றில்

•   வகொயில்- வகொவில்

•   கறுப்பு – கருப்பு

•   இயக்குநர்-இயக்குனர்

•   ௌௌில்லழற-ௌௌில்லழர

•   முறித்தல் – மொரித்தல்

•   மனம்-மனசு- மனது

•   அருகில்-அருகொழமயில்

•   அக்கழர- அக்கழற

•   மங்கலம்- மங்கைம். Hயிற்ௌௌி :

•   Hௌிழயொன பொற்கழை ஒரு Hத்தியில் பகொடுத்து அந்தப் Hௌிழயொன பொற்கழைச் ௌௌொௌௌியொக எழுதச் பெய்தல்

•   ௌௌிறிய Hத்தி ஒன்மற ஆங்கிலத்தில் பகொடுத்து அதழனத் தமிௌௌில் பமொணௌௌிபHயர்க்க ழவத்தல்.

Text books

•   .

Reference Books

•   மு. வரதரொௌௌன், தமிழ் இலக்கிய வரலொறு, ௌௌொௌகித்ய அக்கொபதமி, புதுபடல்லி.

•   மது. ௦. விமௌொனந்தன், தமிழ் இலக்கிய வரலொறு, மீனொட்ௌௌி புத்தக நிழலயம், மதுழர.

•   தமிௌௌண்ணல், புதிய வநொக்கில் தமிழ் இலக்கிய வரலொறு, மீனொட்ௌௌி புத்தக நிழலயம், மதுழர.

•   தமிழ் இலக்கிய வரலொறு –மு�ழனவர்.ௌௌிற்Hௌி Hௌொலசுப்ரமணியம், மு�ழனவர்.பௌொ.வெதுHதி

•   புதிய தமிழ் இலக்கிய வரலொறு– மு�ழனவர்.ௌௌிற்Hௌி Hௌொலசுப்ரமணியம்,நீல.Hத்மநொHன்

- **தமிழ் இலக்கிய வரலொறு - டொக்டர்.அ.கொ.பHருமொள்**
- **தமிழ் இலக்கிய வரலொறு –முழனவர். H.செ.ஏசுதொன்**
- **தமிழ் இலக்கிய வரலொறு - ஸ்ரீ குமொர்**
- **வழகழம வநொக்கில் தமிழ் இலக்கிய வரலொறு–Hொக்கியவமொி**
- **தமிழ் Hயிற்றும் முழற, வHரொெ⊙ிொியர் ந. சுப்புபரட்டியொர் - மணிவொெகர்**
Hதிப்Hகம், ெ⊙தம்Hரம்

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

Web Sources

- **https://www.chennailibrary.com/**
- **https://www.sirukathaigal.com**
- **https://www.tamilvirtualuniversity.org**
- **https://www.noolulagam.com**
- **https://www.katuraitamilblogspot.com**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	
CLO1	3	2	3	3	3	2	2	2	3	2	3	2	
CLO2	3	3	2	2	2	3	2	3	3	2	2	2	
CLO3	3	2	3	3	2	2	2	3	2	3	3	2	
CLO4		3	3	2	2	2	3	2	3	2	3	3	
2. CLO5	3	3	2	2	2	3	3	2	2	2	3	3	

Strong-3, Medium-2, Low-1

SEM II	ENGLISH	Lecture	Practical	Credit
	GENERAL ENGLISH II	6	0	3

Subject Code	Category	L	T	P	S	Credits	Inst. Hours	Marks		
								CIA	External	Total
	Part II	Y	Y	-	-	3	6	25	75	100

Learning Objectives	
LO1	To make students realize the importance of resilience
LO2	To enable them to become good decision makers
LO3	To enable them to imbibe problem-solving skills
LO4	To enable them to use tenses appropriately
LO5	To help them use English effectively at the work place.

Unit No.	Unit Title & Text	No. of Periods for the Unit
I	**RESILIENCE** **Poem** 1.1 Don't Quit – Edgar A. Guest 1.2 Still Here – Langston Hughes **Short Story** 1.3 Engine Trouble – R.K. Narayan 1.4 Rip Van Winkle – Washington Irving	20
II	**DECISION MAKING** **Short Story** 2.1 The Scribe – Kristin Hunter 2.2 The Lady or the Tiger - Frank Stockton **Poem** 2.3 The Road not Taken – Robert Frost 2.4 Snake – D. H Lawrence	20

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III	**PROBLEM SOLVING** **Prose life Story** 3.1 How I taught My Grandmother to Read – Sudha Murthy **Autobiography** 3.3 How frog Went to Heaven – A Tale of Angolo 3.4 Wings of Fire (Chapters 1,2,3) by A.P.J Abdul Kalam	20

IV	**Tenses** 4.1 Present 4.2 Past 4.3 Future 4.4 Concord	15
V	**English in the Workplace** 5.1 E-mail – Invitation, Enquiry, Seeking Clarification 5.2 Circular 5.3 Memo 5.4 Minutes of the Meeting	15

Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Realize the importarice of resilience	PO1,PO7
CO2	Become good decision-makers	PO1,PO2,PO10
CO3	Imbibe problem-solving skills	PO4,PO6,PO9
CO4	Use tenses appropriately	PO4, PO5,PO6
CO5	Use English effectively at the work place.	PO3,PO8

References Books

1   Martin Hewings. Advanced English Grammar. Cambridge University Press, 2000

2   SP Bakshi, Richa Sharma. Descriptive English.Arihant Publications (India) Ltd., 2019.

3.   Sheena Cameron, Louise Dempsey. The Reading Book: A Complete Guide to Teaching Reading. S & L. Publishing, 2019.

4   Barbara Sherman. Skimming and Scanning Techniques, Liberty University Press, 2014.

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5. Phil Chambers. Brilliant Speed Reading: Whatever you need to read, however. Pearson, 2013.
6. Communication Skills : Practical Approach Ed.ShaikhMoula
   Ramendra Kumar. Stories of Resilience, Blue Rose Publications, 2020.

Web Sources

1 Langston Hughes. Still Here

https://poetryace.com/im-still-here

2 R. K. Narayan. Engine Trouble

http://www.sbioaschooltrichy.org/work/Work/images/new/8e.pdf

3 Washington Irving. Rip Van Winkle https://www.gutenberg.org/files/60976/60976-h/60976-h.htm

4 Frank Stockton. The Lady or the Tigerhttps://www.gutenberg.org/ebooks/396

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	3	2
CO2	2	3	3	3	2	3	3	2	2	2
CO3	3	3	3	2	3	3	3	2	3	2
CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	2	3	3	3	3	3	2	2	3

3 – Strong, 2 – Medium , 1 - Low

Mapping with Programme Specific Outcomes:

CO /PO	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3
CO2	3	3	3	3
CO3	3	3	3	3
CO4	3	3	3	3
CO5	3	3	3	3
Weightage	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	CIA	External	Total
									Marks		
CC3	**Object Oriented Programming Concepts Using C++**	Core	5	-	-	-	5	5	25	75	100

Learning Objective	
LO1	Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects
LO2	Understand dynamic memory management techniques using pointers, constructors, destructors, etc
LO3	Describe the concept of function overloading, operator overloading, virtual functions and polymorphism
LO4	Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming
LO5	Demonstrate the use of various OOPs concepts with the help of programs

UNIT	Contents	No. of Hours
I	Introduction to C++ - key concepts of Object-Oriented Programming – Advantages – Object Oriented Languages – I/O in C++ - C++ Declarations. Control Structures : - Decision Makingand Statements : If ..else, jump, goto, break, continue, Switch case statements - Loops in C++ :for, while, do - functions in C++ - inline functions – Function Overloading.	15
II	Classes and Objects: Declaring Objects – Defining Member Functions – Static Member variablesand functions – array of objects –friend functions – Overloading member functions – Bit fieldsand classes – Constructor and destructor with static members.	15
III	Operator Overloading: Overloading unary, binary operators – Overloading Friend functions –type conversion – Inheritance: Types of Inheritance – Single, Multilevel, Multiple, Hierarchal,Hybrid, Multi path inheritance – Virtual base Classes – Abstract Classes.	15
IV	Pointers – Declaration – Pointer to Class , Object – this pointer – Pointers to derived classes andBase classes – Arrays – Characteristics – array of classes – Memory models – new and deleteoperators – dynamic object – Binding, Polymorphism and Virtual Functions.	15
V	Files – File stream classes – file modes – Sequential Read / Write operations – Binary and ASCIIFiles – Random Access Operation – Templates – Exception Handling - String – Declaring andInitializing string objects – String Attributes – Miscellaneous functions.	15
	Total	**75**

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	Course Outcomes	Programme Outcome
CO	Upon completion of the course the students would be able to:	
1	Remember the program structure of C with its syntax and semantics	PO1,PO6
2	Understand the programming principles in C (data types, operators, branching and looping, arrays, functions, structures, pointers and files)	PO2
3	Apply the programming principles learnt in real-time problems	PO4 ,PO5
4	Analyze the various methods of solving a problem and choose the best method	PO6
5	Code, debug and test the programs with appropriate test cases	PO3,PO6
Text Book		
1	E. Balagurusamy, "Object-Oriented Programming with C++", TMH 2013, 7th Edition.	
Reference Books		
1.	Ashok N Kamthane, "Object-Oriented Programming with ANSI and Turbo C++", Pearson Education 2003.	
2.	Maria Litvin& Gray Litvin, "C++ for you", Vikas publication 2002.	
3.	P.Rizwan Ahmed, Programming in C++, Margham Pubications, 2016	
Web Resources		
1.	https://alison.com/course/introduction-to-c-plus-plus-programming	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	2	3	3
CO 3	3	2	2	2	3	2
CO 4	3	3	3	3	2	3
CO 5	3	2	3	2	3	3
Weight age of course contributed to each PSO	15	13	14	12	14	14

S-Strong-3   M-Medium-2   L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	CIA	External	Total
										Marks	
CC4	**Object Oriented Programming Concepts Using C++Lab**	Core	-	-	4	-	5	5	25	75	100

	Course Objective
C1	Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects
C2	Understand dynamic memory management techniques using pointers, constructors, destructors, etc
C3	Describe the concept of function overloading, operator overloading, virtual functions and polymorphism
C4	Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming
C5	Demonstrate the use of various OOPs concepts with the help of programs

S.No	List of Exercises	No. of Hours
1	Write a C++ program to demonstrate function overloading, Default Arguments and Inline function.	
2	Write a C++ program to demonstrate Class and Objects	
3	Write a C++ program to demonstrate the concept of Passing Objects to Functions	
4	Write a C++ program to demonstrate the Friend Functions.	
5	Write a C++ program to demonstrate the concept of Passing Objects to Functions	
6	Write a C++ program to demonstrate Constructor and Destructor	
7	Write a C++ program to demonstrate Unary Operator Overloading	
8	Write a C++ program to demonstrate Binary Operator Overloading	
9	Write a C++ program to demonstrate: • Single Inheritance • Multilevel Inheritance • Multiple Inheritance • Hierarchical Inheritance	60
	• Hybrid Inheritance	
10	Write a C++ program to demonstrate Virtual Functions.	
11	Write a C++ program to manipulate a Text File.	
12	Write a C++ program to perform Sequential I/O Operations on a file.	

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13	Write a C++ program to find the Biggest Number using Command Line Arguments	
14	Write a C++ program to demonstrate Class Template	
15	Write a C++ program to demonstrate Function Template.	
16	Write a C++ program to demonstrate Exception Handling.	

	Course Outcomes	Programme Outcome
CO	Upon completion of the course the students would be able to:	
1	Remember the program structure of C with its syntax and semantics	PO4,PO5
2	Understand the programming principles in C (data types, operators, branching and looping, arrays, functions, structures, pointers and files)	PO6
3	Apply the programming principles learnt in real- time problems	PO4 ,PO5
4	Analyze the various methods of solving a problem and choose the best method	PO6
5	Code, debug and test the programs with appropriate test cases	PO4,PO5

Text Book	
1	E. Balagurusamy, "Object-Oriented Programming with C++", TMH 2013, 7th Edition.

Reference Books	
1.	Ashok N Kamthane, "Object-Oriented Programming with ANSI and Turbo C++", Pearson Education 2003.
2.	Maria Litvin& Gray Litvin, "C++ for you", Vikas publication 2002.

Web Resources	
1.	https://alison.com/course/introduction-to-c-plus-plus-programming

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	2	3	3	2	3
CO 3	3	3	3	3	3	3
CO 4	3	2	2	3	3	3

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 5	3	2	3	3	3	2
Weightage of course contributed to each PSO	15	12	14	15	14	14

 S-Strong-3   M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	CIA	External	Total
									Marks	
SEC2	**INTRODUCTION TO HTML**	(SEC)	2	-	-		2	25	75	100

	Learning Objectives
LO1	Insert a graphic within a web page.
LO2	Create a link within a web page.
LO3	Create a table within a web page.
LO4	Insert heading levels within a web page.
LO5	Insert ordered and unordered lists within a web page. Create a web page.

UNIT	Contents	No. Of. Hours
I	Introduction: Web Basics: What is Internet–Web browsers–What is Webpage –HTML Basics: Understanding tags.	6
II	Tags for Document structure (HTML, Head, Body Tag). Block level text elements: Headings paragraph(<p> tag)–Font style elements:(bold,italic,font,small,strong,strike,bigtags)	6
III	Lists: Types of lists: Ordered, Unordered– Nesting Lists–Other tags: Marquee, HR, BR-Using Images –Creating Hyperlinks.	6
IV	Tables: Creating basic Table, Table elements,Caption–Table and cell alignment–Rowspan,Colspan–Cellpadding.	6
V	Frames: Frameset–Targeted Links–Noframe–Forms:Input, Textarea, Select, Option.	6
	TOTAL HOURS	**30**

	Course Outcomes	Programme Outcomes
CO	On completion of this course, students will	
CO1	Knows the basic concept in HTML Concept of resources in HTML	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Knows Design concept. Concept of Meta Data Understand the concept of save the files.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Understand the page formatting. Concept of list	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Creating Links. Know the concept of creating link to email address	PO1, PO2, PO3, PO4, PO5, PO6

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	Concept of adding images	PO1, PO2, PO3, PO4,
CO5	Understand the table creation.	PO5, PO6

Textbooks		
1	"Mastering HTML5 and CSS3 Made Easy", TeachUComp Inc., 2014.
2	Thomas Michaud, "Foundations of Web Design: Introduction to HTML & CSS"

Web Resources	
1.	ps://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf
2.	ps://www.w3schools.com/html/default.asp

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	2	3	3	3
CO 3	2	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	2	3	3
Weightage of course contributed to each PSO	14	15	14	14	15	15

S-Strong-3   M-Medium-2   L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	CIA	External	Total
								Marks		
SEC3	**Understanding Internet**	(SEC)	2	-	-		2	25	75	100

	Learning Objectives
LO1	Knowledge of Internet
LO2	Learning TCP/IP – Internet Technologies and Protocol
LO3	Learning Internet connectivity.
LO4	Learning internet networks
LO5	Learning Electronic Mail

UNIT	Contents	No. Of. Hours
I	Internet, Growth of Internet, Owners of the Internet, Anatomy of Internet, ARPANET and Internet history of the World Wide Web, basic Internet Terminology, Net etiquette. Internet Applications – Commerce on the Internet, Governance on the Internet, Impact of Internet on Society – Crime on/through the Internet.	**6**
II	Packet switching technology, Internet Protocols: TCP/IP, Router, Internet Addressing Scheme: Machine Addressing (IP address), E-mail Addresses, Resources Addresses	**6**
III	Internet accounts by ISP: Telephone line options, Protocol options, Service options, Telephone line options – Dialup connections through the telephone system, dedicated connections through the telephone system, ISDN, Protocol options – Shell, SLIP, PPP, Service options – E-mail, WWW, News Firewall	**6**
IV	Network definition, Common terminologies: LAN, WAN, Node, Host, Workstation,bandwidth, Interoperability, Network administrator, network security, Network Components: Severs, Clients, Communication Media, Types of network: Peer to Peer,Clients Server, Addressing in Internet: DNS, Domain Name and their organization	**6**
V	Email Networks and Servers, Email protocols –SMTP, POP3, IMAp4, MIME6, Structure of an Email – Email Address, Email Header, Body and Attachments	**6**
	TOTAL HOURS	**30**

	Course Outcomes	Programme Outcomes
CO	On completion of this course, students will	
CO1	On completion of this course, students will	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Knows the basic concept in internet	PO1, PO2, PO3, PO4, PO5, PO6

CO3	Know the concept of TCP/IP – Internet Technologies and Protocol	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Understand the concept of Internet connectivity.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Can be able to know about internet networks	PO1, PO2, PO3, PO4, PO5, PO6

	Textbooks
1	Greenlaw R and Hepp E "Fundamentals of Internet and www" 2nd EL, Tata McGrawHill,2007.
2	D. Comer, "The Internet Book", Pearson Education, 2009

	Reference Book
1	M. L. Young,"The Complete reference to Internet", Tata McGraw Hill, 2007.
2	B. Patel & Lal B. Barik, " Internet & Web Technology ", Acme Learning Publishers.

3	Leon and Leon, "Internet for Everyone", Vikas Publishing House.

	Web Resources
1.	ps://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf
2.	ps://www.w3schools.com/html/default.asp

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	2	3	3	3
CO 3	2	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	2	3	3
Weightage of course contributed to each PSO	14	15	14	14	15	15

S-Strong-3 M-Medium-2 L-Low-1

SEM II	LANGUAGE	Lecture	Practical	Credit
	Resource Management Technique	**6**	**0**	**3**

	Learning Objective	
LO1	To provide adequate knowledge on the application of resource management techniques in business.
LO2	To impart knowledge on the construction of mathematical models for managerial decisions.
LO3	To provide basic understanding of optimal utilization of limited resources by applying the techniques.
LO4	To acquire knowledge about waiting line theory
LO5	Knowledge about decision theory

UNIT	Contents	No. of Hours
I	Introduction to Operation Research - Scope - LPP - Graphical Method - Simplex Method of solving Linear Programming Problems (Simple problems only)	12
II	Transportation Model - Basic Feasible Solution –Northwest corner- least cost method – VAM- balanced & unbalanced TP.	12
III	Assignment Model and Assignment Algorithm –Unbalanced - maximization & minimization - Restricted Assignment problems.	12
IV	Project Management - Network Analysis – CPM - Network Construction - Critical Path and Duration - PERT - Time Estimates for PERT –project length - distinction Between PERT and CPM.	12
V	Game Theory - Meaning - Rules of Game - Saddle Point - Pure strategies – value of the game – Dominance Property - Different Methods of Solving Game Theory problems (No LPP Method).	12
	Total	60

	Course Outcomes	**Programme Outcome**
CO	Upon completion of the course the students would be Able to:	

1	Apply quantitative techniques to formulate business problems into linear programming problems for optimization of results.	PO1
2	Utilize Assignment and transportation model to maximize profit and minimize cost in business.	PO1, PO2
3	Use CPM and PERT to plan, schedule and control project activities.	PO3, PO5
4	Propose the best strategy and predict how firms behave in a specific strategic situation	PO5
5	Develop and apply systematic and analytical decision skills to determine the best choice using decision trees	PO3, PO6

Text Book

1. P.R. Vittal&V.Malini Operation Research, Margham publications,Chennai 2018.
2. V.K Kapoor , Operation Research Techniques for Management, Sultan Chand &sons, New Delhi 2017.

Reference Books

1. M.Sathya Narayana & Lalitha Raman, Operations Research, Himalaya publishing house, Mumbai, 2001
2. Dr.P.K Gupta & DR. Manmohan, problems in Operations Research, Sultan Chand & sons New Delhi 2018.

Web Resources

1. https://www.onlinemathlearning.com › linear-programming-example

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO 2	PSO3	PSO4	PSO 5	PSO6
CO 1	3	3	3	3	3	3
CO 2	3	3	2	3	3	3
CO 3	3	2	2	3	2	3
CO 4	3	3	3	2	2	3
CO 5	3	2	3	2	3	2
Weight age of course contributed to each PSO	15	13	13	13	13	14

S-Strong-3 M-Medium-2L-Low-1

SEM III	LANGUAGE	Lecture	Practical	Credit
	TAMIL III	6	0	3

Course Code	Course Name	Category		L	T	P	S	Credit	Ins.Hrs	CIA	Exter	Total
	பொதுத்தமிழ்-3 தமிகை வரலொறும் ண்ணொடும்	Supportive	Y	-	-	-	3	6	25	75	100
Pre-Requisite		ன்னிபரண்டொம் வகுப்ில் தமிழை ஒரு ொடமொகப் யின்றிருக்க வவண்டும்		SV 2023								

Learning Objectives
• தமிழக வரலாற்றை அிந்துயகாள்ளுதல்.
• தமிழரின் வொழ்வியல் யதான்றமறெ அிதல்.
• தமிழரின் பண்பாட்டிறன அிந்துயகாள்ளல்.
• தமிழர்மமல் நிகழ்ந்த பிை பண்பாட்டுத் தாக்கங்கறள அிதல்.
• தமிழ் இலக்கியம் ொொர்ந்த வொட்டித் வதர்வுகளுக்கு ஏற் கற்ித்தல்
நழடமுழறகழை
வமற்பகொள்ளுதல்

Expected Course Outcomes
On the Sucessful completion of the Course, Students will be able to
இப்ொடத்ழதக் கற்தொல் ின்வரும் யன்கழை மொணவர் அழடவர்

CO 1	தமிழக வரலாற்றை அிந்துயகாள்வர்.	K4
CO 2	தமிழரின் வொழ்வியல் யதான்றமறெ அிவர்.	K5, K6
CO 3	தமிழரின் பண்பாட்டுக் கூறுகறள அிந்துயகாள்வர்	K3
CO 4	பிை பண்பாட்டுத் தாக்கம் மற்றும் அணுகுமுறைகறள அிவர்.	K3
CO 5	பமொைிப்யிற்ிக்குத் வதழவயொன இலக்கணங்கழைக் கற்ர்.	K2

K1 - Remember; K2 - Undestand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

அலகு-1 பதொல் Hஎ◌ங்கொல வரலொறும் எ◌ங்ககொல வரலொறும்
1.பதொல் தமிஎ◌ர்
2.Hழைய கற்கொலம்
3.புதிய கற்கொலம்
4.உவலொகக் கொலம்
5.அகழ்வொரொய்ச்எ◌ியில் தமிழும் தமிஎ◌ரும் (கீஎ◌டி வழர)
6.திழண வொழ்வியல் (கைவு வொழ்க்ழக, கற்பு வொழ்க்ழக, உணவு,
அணிகலன்கள், வொணிகம்,விழையொட்டுகள்)
7.கல்வியும், கழலகளும்
8.தமிழ் வைர்த்த எ◌ங்கம்
9.எ◌ங்க கொல ஆட்எ◌ி முழற

10 . அயல்நொட்டுத் பதொடர்புகள்
அலகு-2 ஆட்எ◌ியர் வரலொறு
1.மூவவந்தர் வரலொறு
2.Hல்லவர் வரலொறு
3.நொய்க்கர் ஆட்எ◌ி
4.முகம்மதியர் ஆட்எ◌ி
5.மரொட்டியர் ஆட்எ◌ி
அலகு-3 ஐவரொப்Hியர் கொல வரலொறு
1.வHொர்த்துக்கீஎ◌ியர்
2.டச்சுக்கொரர்கள்
3.வடனிஸ்கொரர்கள்
4.Hிபரஞ்சுக்கொரர்கள்
5.ஆங்கிவலயர்கள்
6.Hொஎ◌ழயக்கொரர்கள்
7.இந்திய விடுதழலப் வHொரொட்டத்தில் தமிழ்நொடு
அலகு-4 விடுதழலக்குHின் தமிழ்நொட்டு வரலொறு
7.பமொஎ◌ிப்வHொரொட்டம்
8.எ◌ழூக மறுமலர்ச்எ◌ி
9.பதொஎ◌ில்நுட்H வைர்ச்எ◌ி
அலகு-5 பமொஎ◌ிப்Hயிற்எ◌ி
• நிறுத்தக் குறிகள்
• கழலச்பொற்கள்
• பமொஎ◌ிபHயர்ப்பு
Hயிற்எ◌ி :ஆங்கிலக் கழலச் பொற்கஎ◌ழக் பகொடுத்து அவற்ழறத் தமிஎ◌ில்
பமொஎ◌ிபHயர்க்கச் பெய்தல்.
Text books
• தமிழக வரலாறும் பண்பாடும் - மக.மக. பிள்ளள, உலகத் தமிழாராய்ச்சி
நிறுவனம், யசன்றன,
• தமிழர் நாகரிகமும் பண்பாடும் - அ. தட்சிணாமூர்த்தி, எ◌ொழ் யவளியீடு,
யசன்றன,.

• தமி⊙க வரலொறும் H⊙ண்H⊙ொடும் - வவ.தி. பெல்லம், மணிவாசகர் பதிப்பகம், யசன்றன,

• ஆதிச்⊙நெல்லூர் முதல் கீ⊙டி வழர நுவவதொ லூயிஸ், கி⊙க்குப் Hதிப்Hகம், பென்ழன.

• H⊙ண்H⊙ொட்டு மொனிடவியல் - H⊙க்தவத்⊙ல H⊙ொரதி, அறை⊙⊙ளம் பதிப்பகம், திருச்⊙ி.

• .தமி⊙ர் வமல் நிகழ்ந்த H⊙ண்H⊙ொட்டுப் Hழடபயடுப்புகள், க.H. அறவொணன், தமிழ்க்வகொட்டம், பென்ழன.

Reference Books

• தமிழக சமுதா⊙ பண்பாட்டு கறல வரலாறு - கு. மசதுராமன், என்.சி.பி.எச், யசன்றன,

• தமிழர் கறலயும் பண்பாடும் - அ.கா. யபருமாள், என்.சி.பி.எச், யசன்றன.

• ஒரு பண்பாட்டின் பெணம்: சிந்து முதல் றவறக வறர - ஆர். பாலகிருஷ்ணன், மராஜா முத்றதொ ஆராய்ச்சி நூலகம், யசன்றன.

• தமிழும் Hஃிற H⊙ண்H⊙ொடும் - பத.பH⊙ொ. மீ⊙னொட்⊙ி சுந்தரனொர், நியூ பெஞ்⊙சரி புக் ஹவுஸ், பென்ழன

• தமி⊙ர் வரலொறும் H⊙ண்H⊙ொடும் - நீலகண்ட ⊙ொ⊙ொஸ்⊙தெிரி, ஸ்ரீபெண்H⊙கொ Hதிப்Hகம், பென்ழன

• தமிழர் வரலாறும் தமிழர் பண்பாடும் - மா.இராசமாணிக்கனார்

• தமிழர் நாகரிக வரலாறு - க.த.திருநாவுக்கரசு, யதால்காப்பி⊙ர் நூலகம், யசன்றன.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
Web Sources
• **https://www.chennailibrary.com/**
• **https://www.sirukathaigal.com**
• **https://www.tamilvirtualuniversity.org**
• **https://www.noolulagam.com**
• **https://www.katuraitamilblogspot.com**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2
CLO 1	3	2	3	2	2	3	2	2	2	2	3	3
CLO 2	2	2	2	3	3	2	2	3	3	2	2	2
CLO 3	3	3	3	2	2	3	3	2	3	3	3	3
CLO 4	3	2	3	3	3	3	2	2	2	2	3	2
CLO 5	2	2	3	3	2	2	3	3	2	3	3	2

Strong-3, Medium-2, Low-1

SEM III	ENGLISH	Lecture	Practical	Credit
	GENERAL ENGLISH III	6	0	3

Subject Code	Category	L	T	P	S	Credits	Inst. Hours	Marks		
								CIA	External	Total
	Part II	Y	Y	-	-	3	6	25	75	100

Learning Objectives	
LO1	To make them active listeners
LO2	To enhance the interpersonal relationship skills
LO3	To embolden them to cope with stress
LO4	To master grammar skills
LO5	To help them to use English effectively in a business environment

Unit No.	Unit Title & Text	No. of Periods for the Unit
I	**ACTIVE LISTENING** **Short Story** 1.1 In a Grove – AkutagawaRyunosuke Translated from Japanese by Takashi Kojima 1.2 The Gift of the Magi – O' Henry **Prose** 1.3 Listening – Robin Sharma 1.4 Nobel Prize Acceptance Speech – WangariMaathai	20
II	**INTERPERSONAL RELATIONSHIPS** **Prose** 2.1 Telephone Conversation – Wole Soyinka 2.2 Of Friendship – Francis Bacon **Song on (Motivational/ Narrative)** 2.3 Ulysses – Alfred Lord Tennyson 2.4 And Still I Rise – Maya Angelou	20
III	**COPING WITH STRESS** **Poem** 3.1 Leisure – W.H. Davies 3.2 Anxiety Monster – RhonaMcFerran **Readers Theatre** 3.3 The Forty Fortunes: A Tale of Iran 3.4 Where there is a Will – Mahesh Dattani	20

IV	**Grammar** 4.1 Phrasal Verbs & Idioms 4.2 Modals and Auxiliaries 4.3 Verb Phrases – Gerund, Participle, Infinitive	15
V	**Composition/ Writing Skills** 5.1 Official Correspondence – Leave Letter, Letter of Application, Permission Letter 5.2 Drafting Invitations 5.3 Brochures for Programmes and Events	15

Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Listen actively	PO1,PO7
CO2	Develop interpersonal relationship skills	PO1,PO2,PO10
CO3	Acquire self-confidence to cope with stress	PO4,PO6,PO9
CO4	Master grammar skills	PO4,PO5,PO6
CO5	Carry out business communication effectively	PO3,PO8

Text Books (Latest Editions)

1	Wangari Maathai – Nobel Lecture. Nobel Prize Outreach AB 2023. Jul 2023.
2	Mahesh Dattani, Where there is a Will. Penguin, 2013.
3	Martin Hewings, Advanced English Grammar, Cambridge University Press, 2000
4	EssentialEnglish Grammar by Raymond Murphy

Web Resources

1	WangariMaathai – Nobel Lecture. Nobel Prize Outreach AB 2023. Mon. 17 Jul 2023. https://www.nobelprize.org/prizes/peace/2004/maathai/lecture/
2	Telephone Conversation - Wole Soyinka https://www.k-state.edu/english/westmank/spring_00/SOYINKA.html
3	Anxiety Monster- RhonaMcFerran- www.poetrysoup.com

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	3	2
CO2	2	3	3	3	2	3	3	2	2	2
CO3	3	3	3	2	3	3	3	2	3	2
CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	2	3	3	3	3	3	2	2	3

3 – Strong, 2 – Medium , 1 - Low

Title of the Course/ Paper	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
CC5	Data Structure and Algorithms	Core	5	-	-	-	5	5	25	75	100

	Learning Objectives	
LO1	To understand the concepts of ADTs	
LO2	To learn linear data structures-lists, stacks, queues	
LO3	To learn Tree structures and application of trees	
LO4	To learn graph structures and application of graphs	
LO5	To understand various sorting and searching	

UNIT	Contents	No. of Hours
I	Abstract Data Types (ADTs)- List ADT-array-based implementation-linked list implementation singly linked lists-circular linked lists-doubly-linked lists-applications of lists-Polynomial Manipulation- All operations-Insertion-Deletion-Merge-Traversal	15
II	Stack ADT-Operations- Applications- Evaluating arithmetic expressions – Conversion of infix to postfix expression-Queue ADT-Operations-Circular Queue- Priority Queue- deQueue applications of queues.	15
III	Tree ADT-tree traversals-Binary Tree ADT-expression trees-applications of trees-binary search tree ADT- Threaded Binary Trees-AVL Trees- B-Tree- B+ Tree – Heap-Applications of heap.	15
IV	Definition- Representation of Graph- Types of graph-Breadth first traversal – Depth first traversal-Topological sort- Bi-connectivity – Cut vertex- Euler circuits-Applications of graphs.	15
V	Searching- Linear search-Binary search-Sorting-Bubble sort-Selection sort-Insertion sort-Shell sort-Radix sort-Hashing-Hash functions-Separate chaining- Open Addressing-Rehashing Extendible Hashing	15
	Total	**75**

	Course Outcomes	Programme Outcome
CO	On completion of this course, students will	
CO1	Understand the concept of Dynamic memory management, data types, algorithms, Big O notation	PO1,PO6
CO2	Understand basic data structures such as arrays, linked lists, stacks and queues	PO2

CO3	Describe the hash function and concepts of collision and its resolution methods	PO2,PO4
CO4	Solve problem involving graphs, trees and heaps	PO4,PO6
CO5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data	PO5,PO6

Text Book		
1	1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Pearson Education 2014, 4th Edition.	
2	ReemaThareja, "Data Structures Using C", Oxford Universities Press 2014, 2nd Edition	

Reference Books		
1.	Thomas H.Cormen,ChalesE.Leiserson,RonaldL.Rivest, Clifford Stein, "Introduction to Algorithms", McGraw Hill 2009, 3rd Edition.	
2.	Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education 2003	
3.	P Rizwan Ahmed, C++ and Data Structure , Margham Pubications, 2015	

Web Resources		
1.	https://www.programiz.com/dsa	
2.	https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	1	3	3	3
CO 3	3	3	3	2	3	2
CO 4	3	2	3	2	3	3
CO 5	3	3	3	3	3	3
Weightage of course contributed to each PSO	15	14	13	13	15	14

S-Strong-3   M-Medium-2   L-Low-1

Title of the Course/ Paper	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
CC6	**Data Structure and Algorithms Lab** [Note: Practicals may be offered through C / C++ / Python]	Core	-	-	4	-	5	5	25	75	100

<table>
<tr><td colspan="3" align="center">Learning Objectives</td></tr>
<tr><td>LO1</td><td colspan="2">To understand the concepts of ADTs</td></tr>
<tr><td>LO2</td><td colspan="2">To learn linear data structures-lists, stacks, queues</td></tr>
<tr><td>LO3</td><td colspan="2">To learn Tree structures and application of trees</td></tr>
<tr><td>LO4</td><td colspan="2">To learn graph structures and application of graphs</td></tr>
<tr><td>LO5</td><td colspan="2">To understand various sorting and searching</td></tr>
<tr><td>Sl. No</td><td align="center">Contents</td><td>No. of Hours</td></tr>
<tr><td>1.</td><td>Write a program to implement the List ADT using arrays and linked lists.</td><td rowspan="4" align="center">60</td></tr>
<tr><td>2.</td><td>Write a programs to implement the following using a singly linked list.
Stack ADT
Queue ADT</td></tr>
<tr><td>3.</td><td>Write a program that reads an infix expression, converts the expression to postfix form and then evaluates the postfix expression (use stack ADT).</td></tr>
<tr><td>4.</td><td>Write a program to implement priority queue ADT.</td></tr>
<tr><td>5.</td><td>Write a program to perform the following operations:
Insert an element into a binary search tree.
Delete an element from a binary search tree.
Search for a key element in a binary search tree.</td><td></td></tr>
<tr><td>6.</td><td>Write a program to perform the following operations
Insertion into an AVL-tree
Deletion from an AVL-tree</td><td></td></tr>
<tr><td>7.</td><td>Write a programs for the implementation of BFS and DFS for a given graph.</td><td></td></tr>
</table>

8	Write a programs for implementing the following searching methods: • Linear search • Binary search.		
9.	Write a programs for implementing the following sorting methods: • Bubble sort • Selection sort • Insertion sort • Radix sort.		
	Total		**60**

	Course Outcomes	Programme Outcome
CO	On completion of this course, students will	
1	Understand the concept of Dynamic memory management, data types, algorithms, Big O notation	PO1,PO4,PO5
2	Understand basic data structures such as arrays, linked lists, stacks and queues	PO1, PO4,PO6
3	Describe the hash function and concepts of collision and its resolution methods	PO1,PO3,PO6
4	Solve problem involving graphs, trees and heaps	PO3,PO4
5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data	PO1,PO5,PO6
	Text Book	
1	Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Pearson Education 2014, 4th Edition.	
2	ReemaThareja, "Data Structures Using C", Oxford Universities Press 2014, 2nd Edition	
	Reference Books	
1	Thomas H.Cormen,Chales E.Leiserson,RonaldL.Rivest, Clifford Stein, "Introduction to Algorithms", McGraw Hill 2009, 3rd Edition	
2.	Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education 2003	
	Web Resources	

1.	https://www.programiz.com/dsa
2.	https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	1	3	2	3
CO 3	3	3	3	3	2	3
CO 4	3	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightage of course contributed to each PSO	15	15	13	15	13	15

S-Strong-3   M-Medium-2   L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
EC3	**Introduction to Data Science**	Elective	4	-	-	-	3	4	25	75	100

	Learning Objectives		
LO1	To learn about basics of Data Science and Big data.		
LO2	To learn about overview and building process of Data Science.		
LO3	To learn about various Algorithms in Data Science.		
LO4	To learn about Hadoop Framework.		
LO5	To learn about case study about Data Science.		

UNIT	Contents	No. of Hours
I	**Introduction:** Benefits and uses – Facts of data – Data science process – Big data ecosystem and data science	12
II	**The Data science process**: Overview – research goals - retrieving data - transformation – Exploratory Data Analysis – Model building .	12
III	**Algorithms** :Machine learning algorithms – Modeling process – Types – Supervised – Unsupervised - Semi-supervised	12
IV	**Introduction to Hadoop** :Hadoop framework – Spark – replacing MapReduce– NoSQL – ACID – CAP – BASE – types	12
V	**Case Study**: Prediction of Disease - Setting research goals - Data retrieval – preparation - exploration - Disease profiling - presentation and automation	12
	Total	**60**

	Course Outcomes	Programme Outcome
CO	On completion of this course, students will	
CO1	Understand the basics in Data Science and Big data.	PO1
CO2	Understand overview and building process in Data Science.	PO1, PO2
CO3	Understand various Algorithms in Data Science.	PO3, PO6
CO4	Understand Hadoop Framework in Data Science.	PO4, PO5

CO5	Case study in Data Science.	PO3, PO5
Text Book		
1	Davy Cielen, Arno D. B. Meysman, Mohamed Ali, "Introducing Data Science", manning publications 2016	
Reference Books		
1.	Roger Peng, "The Art of Data Science", lulu.com 2016.	
2.	MurtazaHaider, "Getting Started with Data Science – Making Sense of Data with Analytics", IBM press, E-book.	
3.	Davy Cielen, Arno D.B. Meysman, Mohamed Ali,"Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools", Dreamtech Press 2016.	
4.	Annalyn Ng, Kenneth Soo, "Numsense! Data Science for the Layman: No Math Added", 2017,1st Edition.	
5.	Cathy O'Neil, Rachel Schutt, "Doing Data Science Straight Talk from the Frontline", O'Reilly Media 2013.	
6.	Lillian Pierson, "Data Science for Dummies", 2017 II Edition	
Web Resources		
1.	https://www.w3schools.com/datascience/	
2.	https://en.wikipedia.org/wiki/Data_science	
3.	http://www.cmap.polytechnique.fr/~lepennec/en/post/references/refs/	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	3	3	2	3	3	2
Weightage of course contributed to each PSO	**15**	**14**	**11**	**15**	**11**	**10**

 S-Strong-3 M-Medium-2   L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	CIA	External	Total
										Marks	
EC3	**Office Automation**	Elective 2	-	-	-	-	3	4	25	75	100

	Learning Objectives
LO1	Understand the basics of computer systems and its components.
LO2	Understand and apply the basic concepts of a word processing package.
LO3	Understand and apply the basic concepts of electronic spreadsheet software.
LO4	Understand and apply the basic concepts of database management system.
LO5	Understand and create a presentation using PowerPoint tool.

UNIT	Contents	No. of Hours
I	Introductory concepts: Memory unit– CPU-Input Devices: Key board, Mouse and Scanner. Output devices: Monitor, Printer. Introduction to Operating systems &its features: DOS– UNIX–Windows. Introduction to Programming Languages.	6
II	**Word Processing:** Open, Save and close word document; Editing text – tools, formatting, bullets Spell Checker - Document formatting – Paragraph alignment, indentation, headers and footers, numbering; printing–Preview, options, merge.	6
III	**Spread sheets:** Excel– opening, entering text and data, formatting, navigating; Formulas– entering, handling and copying; Charts–creating, formatting and printing,analysistables,preparationoffinancialstatements,introduction to data analytics.	6

| IV | **Database Concepts:** The concept of data base management system; Data field, records, and files, Sorting and indexing data; Searching records. Designing queries, and reports; Linking of data files; Understanding Programming environment in DBMS; Developing menu drive application in query language(MS–Access). | 6 |
| V | **Power point:** Introduction to Power point - Features – Understanding slide typecasting &viewing slides – creating slide shows. Applying special object – including objects & pictures – Slide transition– Animation effects, audio inclusion, timers. | 6 |

	Total		30
	Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will		
CO1	Possess the knowledge on the basics of computers and its components		PO1,PO2,PO3,PO6,PO8
CO2	Gain knowledge on Creating Documents, spreadsheet and presentation.		PO1,PO2,PO3,PO6
CO3	Learn the concepts of Database and implement the Query in Database.		PO3,PO5,PO7
CO4	Demonstrate the understanding of different automation tools.		PO3,PO4,PO5,PO7
CO5	Utilize the automation tools for documentation, calculation and presentation purpose.		PO4,PO6,PO7,PO8
	Text Book		
1	PeterNorton,"IntroductiontoComputers"–TataMcGraw-Hill.		
2.	P.Rizwan Ahmed, Office Automation, Margham Publications, 2019		
	Reference Books		
1.	Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, "Microsoft 2003", Tata McGrawHill.		
	Web Resources		
1.	https://www.udemy.com/course/office-automation-certificate-course/		
2.	https://www.javatpoint.com/automation-tools		

Mapping with Programme Outcomes:

MAPPING TABLE						
CO/ PSO	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	3	2	2	3	3	3
CO2	3	3	3	3	3	3
CO3	3	3	3	3	3	3
CO4	3	3	3	3	3	3
CO5	3	3	3	3	3	3

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
SEC4	**Problem Solving Techniques**	FC	2	-	-	-	1	1	25	75	100

	Learning Objectives
LO1	Familiarize with writing of algorithms, fundamentals of C and philosophy of problem solving.
LO2	Implement different programming constructs and decomposition of problems into functions.
LO3	Use data flow diagram, Pseudo code to implement solutions.
LO4	Define and use of arrays with simple applications
LO5	Understand about operating system and their uses

UNIT	Contents	No. Of. Hours
I	**Introduction:** History, characteristics and limitations of Computer. Hardware/Anatomy of Computer: CPU, Memory, Secondary storage devices, Input Devices and Output devices. Types of Computers: PC, Workstation, Minicomputer, Main frame and Supercomputer. Software: System software and Application software. **Programming Languages:** Machine language, Assembly language, High- level language,4 GL and 5GL-Features of good programming language. Translators: Interpreters and Compilers.	6
II	**Data:** Data types, Input, Processing of data, Arithmetic Operators, Hierarchy of operations and Output. Different phases in Program Development Cycle (PDC).**Structured Programming: Algorithm:** Features of good algorithm, Benefits and drawbacks of algorithm. **Flowcharts:** Advantages and limitations of flowcharts, when to use flowcharts, flowchart symbols and types of flowcharts.**Pseudocode:** Writing a pseudocode. Coding, documenting and testing a program: Comment lines and types of errors. **Program design:** Modular Programming.	6
III	**Selection Structures:** Relational and Logical Operators - Selecting from Several Alternatives – Applications of Selection Structures. **Repetition Structures:** Counter Controlled Loops –Nested Loops– Applications of Repetition Structures.	6
IV	**Data:** Numeric Data and Character Based Data. **Arrays:** One Dimensional Array - Two Dimensional Arrays – Strings as Arrays of Characters.	6

V	**Data Flow Diagrams:** Definition, DFD symbols and types of DFDs. **Program Modules:** Subprograms-Value and Reference parameters- Scope of a variable - Functions – Recursion. **Files:** File Basics-Creating and reading a sequential file- Modifying Sequential Files.	**6**
	TOTAL HOURS	**30**

	Course Outcomes	**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Study the basic knowledge of Computers. Analyze the programming languages.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Study the data types and arithmetic operations. Know about the algorithms. Develop program using flow chart and pseudocode.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Determine the various operators. Explain about the structures. Illustrate the concept of Loops	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Study about Numeric data and character-based data. Analyze about Arrays.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Explain about DFD Illustrate program modules. Creating and reading Files	PO1, PO2, PO3, PO4, PO5, PO6

	Textbooks
1	**Stewart Venit,** "Introduction to Programming: Concepts and Design", Fourth Edition, 2010, Dream Tech Publishers.

	Web Resources
1.	https://www.codesansar.com/computer-basics/problem-solving-using-computer.htm
2.	http://www.nptel.iitm.ac.in/video.php?subjectId=106102067
3.	http://utubersity.com/?page_id=876

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	2	3	3	3	3
CO 4	3	3	2	3	3	3
CO 5	3	3	3	3	3	2

Weightage of course contributed to each PSO	15	14	14	15	15	14

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	CIA	External	Total
										Marks	
SEC5	**PHP PROGRAMMING**	(SEC)	2	-	-	-	2	2	25	75	100

	Learning Objectives
LO1	To provide the necessary knowledge on basics of PHP.
LO2	To design and develop dynamic, database-driven web applications using PHP version.
LO3	To get an experience on various web application development techniques.
LO4	To learn the necessary concepts for working with the files using PHP.
LO5	To get a knowledge on OOPS with PHP.

UNIT	Contents	No. of Hours
I	Introduction to PHP -Basic Knowledge of websites -Introduction of Dynamic Website -Introduction to PHP -Scope of PHP - XAMPP and WAMP Installation	6
II	PHP Programming Basics -Syntax of PHP -Embedding PHP in HTML - Embedding HTML in PHP. Introduction to PHP Variable -Understanding Data Types -Using Operators - Using Conditional Statements -If(), else if() and else if condition Statement.	6
III	Switch() Statements -Using the while() Loop -Using the for() Loop PHP Functions. PHP Functions -Creating an Array -Modifying Array Elements - Processing Arrays with Loops - Grouping Form Selections with Arrays - Using Array Functions.	6
IV	PHP Advanced Concepts -Reading and Writing Files -Reading Data from a File.	6
V	Managing Sessions and Using Session Variables -Destroying a Session - Storing Data in Cookies -Setting Cookies.	6
	Total	**30**

	Course Outcomes	Programme Outcomes
CO	On completion of this course, students will	
CO1	Write PHP scripts to handle HTML forms	PO1,PO4,PO6
CO2	Write regular expressions including modifiers, operators, and meta characters.	PO2,PO5,PO7.
CO3	Create PHP Program using the concept of array.	PO3,PO4,PO5.

CO4	Create PHP programs that use various PHP library functions	PO2,PO3,PO5

CO5	Manipulate files and directories.	PO3,PO5,PO6.
Text Book		
1	Head First PHP & MySQL: A Brain-Friendly Guide- 2009-Lynn mighley and Michael Morrison.	
2	The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL- Alan Forbes	
Reference Books		
1.	PHP: The Complete Reference-Steven Holzner.	
2.	DT Editorial Services (Author), "*HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)*", Paperback 2016, 2ndEdition.	
Web Resources		
1.	Open source digital libraries: PHP Programming	
2.	https://www.w3schools.com/php/default.asp	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	**3**	**2**	**1**	**2**	**1**	**2**
CO2	**3**	**3**	**2**	**2**	**3**	**3**
CO3	**3**	**3**	**2**	**3**	**3**	**2**
CO4	**3**	**2**	**3**	**2**	**2**	**3**
CO5	**3**	**2**	**2**	**2**	**3**	**3**
Weightage of course contributed to each PSO	**15**	**12**	**10**	**11**	**12**	**13**

S-Strong-3 M-Medium-2 L-Low-1

SEM IV	LANGUAGE	Lecture	Practical	Credit
	TAMIL IV	6	0	3

Learning Objectives
• தாய்மமாழி வழி௦௦ாக அ௦விவி௦௦ல் பற்௦௦ி௦ சிந்தறனகறள வளர்த்தல்.
• அ௦விவி௦௦ல் கறலச் ௦சால்லாக்கம் பற்௦௦ிப் பெற்றுவித்தல்.
• மாணவர்களுக்கு அ௦விவி௦௦ல் பார்றவ௦ ஏற்படுத்துதல்.
• தமிழில் அ௦விவி௦௦ல் பறைப்பிலக்கி௦௦ங்கறள உருவாக்கத் தூண்டுதல்
• தமிழ் இலக்கியம் ௦ொர்ந்த வH௦ாட்டித் வதர்வுகளுக்கு ஏற்H கற்Hித்தல்
நழடமுழறகழ
வமற்பகொள்ளுதல்

Expected Course Outcomes
On the Sucessful completion of the Course, Students will be able to
இப்H௦ாடத்ழதக் கற்Hதொல் Hின்வரும் Hயன்கழை மொணவர் அழடவர்
CO 1   தாய்மமாழி வழி௦௦ாக அ௦விவி௦௦ல் பற்௦௦ிச் சிந்திக்கும் தி௦ன்
யபற்௦௦ிருப்பர். K4
CO 2   அ௦விவி௦௦ல் கறலச் ௦சால்லாக்கம் பற்௦௦ி௦ விதிகள், நுணுக்கங்கறளத்
யதரிந்திருப்பர்.   K5, K6
CO 3   அ௦விவி௦௦ல் தமிழ் வளர்ச்சி௦௦ில் யமாழியபெர்ப்பின் பங்கு கு௦ித்து
அ௦ிந்திருப்பர்.   K3
CO 4   பமொ௦ியறிவவொடு ௦ிந்தழனத்திறழனப் பHறுவர் K3
CO 5   பமொ௦ிப்Hயிற்௦ொ௦ிக்குத் வதழவயொன இலக்கணங்கழைக் கற்Hர்.
  K2
K1 - Remember; K2 - Undestand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create
அலகு-1   தமி௦௦ொ௦ின் அறிவியல் ௦௦ிந்தழனகள்
• அறிவியலும் மனித வொழ்வும்
• ஐந்திழணப் Hகுப்பும் சூ௦௦லியலும்
• ப௦தா௦௦ில்நுட்H வமலொண்ழம
• நீர் நில வமலொண்ழம
அலகு-2   H௦ந்தமிழ் இலக்கியங்க௦ில் அறிவியல் ௦௦ிந்தழனகள்
1. நிலவியல்

2.உவலொகவியல்
3.வொனவியல்
4.உயிரியல்
5.௦ைவியல்
அலகு-3   இழடக்கொல இலக்கியங்க௦ில் அறிவியல் ௦ிந்தழனகள்
1.கொப்H௦ியங்க௦ில் அறிவியல்

2.ெிற்றிலக்கியங்களில் அறிவியல்

3.உழரநூல்களில் அறிவியல்

அலகு-4   இழணயத் தமிழ்

1.இழணயத் தமிழ் Hயன்Hொடு - அறிமுகம்

2.இழணயத்தமிழ்க் கல்விக்கைகம்

3.இழணய நூலகம்

4.பெயற்ழக நுண்ணறிவியல்

5.தமிழ்நொட்டு அறிவியல் ஆளுழமகள்

அலகு-5   கடிதம் எழுதுதலும் கட்டுழர எழுதுதலும்

• உறவு முழறக் கடிதப் Hயிற்ெி

• அலுவலகக் கடிதப் Hயிற்ெி

• விண்ணப்Hப் Hடிவம் எழுதும் Hயிற்ெி

• தன் விவரப் Hடிவம் எழுதும் Hயிற்ெி

• கருத்து விைைக்கக் கட்டுழரகள் எழுதும் Hயிற்ெி

• Hத்தெிரிழகககளுக்குக் கட்டுழர எழுதும் Hயிற்ெி

Text books

• ஐிவிெல் தமிழ் இன்றைெ நிறல - இராதா யசல்லப்பன், உலகத் தமிழாராய்ச்சி நிறுவனம், யசன்றன.

• மணறவ முஸ்தபா, தமிழில் ஐிவிெல் பறைப்பிலக்கிெம், மணறவ பப்ளிமகஷன், யசன்றன.

• கறலச்யசால்லாக்கம் - மங்றக, ரங்கராசபுரம், யசன்றன .•

Reference Books

1.தமிழைர் வைவொண்ழம மரபுகள் - இல).பெ.கந்தெொமி

• 2. ெங்க இலக்கியத்தில் வைவொண் ெ்ழுதொயம், பH.மொழதயன், நியூ பெஞ்செரி புக் ஹவுஸ்

3. தமிழைில் அறிவியல் இதழ்கள்ெொழுவவல்- ரொ.Hொர்வவந்தன் ஃHிஷ்கிறீன் Hதிப்Hகம், வகொழவ

4.அறிவியல் தமிழ் - Hதிப்Hொஎொெிொியர் இரொதொ பெல்லப்Hன்,Hொரதிதொெ்ன் Hல்கழலக்கைகம், திருச்ெிரொப்Hள்ைைி.

5.இழணயத் தமிழ் வரலொறு, மு.பHொன்னழவக்வகொ, Hொரதிதொெ்ன் Hல்கழலக்கைகம்

6.இழணயத் தமிழ், ெந்தெிரிகொ சுப்Hிரமணியம் - ெந்திவரொதயம் Hதிப்Hகம்

7.இழணயழும் இனிய தமிழும் - துழர. மணியரென், இழெ Hதிப்Hகம்

8.கணினித் தமிழ், இல. சுந்தரம் - விகடன் Hிரசுரம்

9.மொண்புமிகு மண், Hொெமயன், வம்ெி புக்ஸ்

10. தமிழ் இலக்கியத்தில் அறிவியல் ெிந்தழனகள் வொனதி Hதிப்Hகம், பென்ழன

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

Web Sources

• https://www.chennailibrary.com/

• https://www.sirukathaigal.com

• https://www.tamilvirtualuniversity.org

• https://www.noolulagam.com

- **https://www.katuraitamilblogspot.com**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	
CLO1	3	2	3	3	3	2	2	2	3	2	3	2	
CLO2	3	3	2	2	2	3	2	3	3	2	2	2	
CLO3	3	2	3	3	2	2	2	3	2	3	3	2	
CLO4		3	3	2	2	2	3	2	3	2	3	3	
CLO5	3	3	2	2	2	3	3	2	2	2	3	3	

3.

Strong -3,Medium-2,Low-1

SEM II	ENGLISH	Lecture	Practical	Credit
	GENERAL ENGLISH II	**6**	**0**	**3**

Subject Code	Category	L	T	P	S	Credits	Inst. Hours	Marks		
								CIA	External	Total
	Part II	Y	Y	-	-	3	6	25	75	100
	Learning Objectives									
LO1	To help learners imbibe goal-setting attitude.									
LO2	To enable them to understand the value of integrity.									
LO3	To help them deal with emotions.									
LO4	To teach the learners to frame sentences using tenses.									
LO5	To enhance reporting skills.									

Unit No.	Unit Title & Text	No. of Periods for the Unit
I	**GOAL SETTING (UNICEF)** **Life Story** 1.1 From Chinese Cinderella – Adeline Yen Mah 1.2 Why I Write - George Orwell **Short Essay** 1.3 On Personal Mastery – Robin Sharma 1.4 On the Love of Life – William Hazlitt	20

| **II** | **INTEGRITY**
 Short Story
 2.1 The Taxi Driver – K.S. Duggal
 2.2 Kabuliwala - Rabindranath Tagore
 2.3 A Retrieved Reformation – O Henry

 Extract from a play

 2.4 The Quality of Mercy (Trial Scene from the Merchant of Venice - Shakespeare) | 20 |

III	**COPING WITH EMOTIONS** **Poem** 3.1 Pride – Dahlia Ravikovitch 3.2 Phenomenal Woman – Maya Angelou **Reader's Theatre** 3.3 The Giant's Wife A Tall Tale of Ireland – William Carleton 3.4 The Princess and the God : A Tale of Ancient India	20	

IV	**Language Competency Sentences** 4.1 Simple Sentences 4.2 Compound Sentences 4.3 Complex Sentences **Direct and Indirect Speech**	15	
V	**Report Writing** 5.1 Narrative Report 5.2 Newspaper Report **Drafting Speeches** 5.3 Welcome Address 5.4 Vote of Thanks	15	

Course Outcomes

Course Outcomes	On completion of this course, students will	
CO1	Determine their goals	PO1,PO7
CO2	Identify the value of integrity.	PO1,PO2,PO10
CO3	Deal with emotions.	PO4,PO6,PO9
CO4	Frame grammatically correct sentences	PO4,PO5,PO6
CO5	Write cohesive reports.	PO3,PO8

Text Books (Latest Editions)

1	Oxford Practice Grammar , John Eastwood, Oxford University Press
2	Cambridge Grammar of English , Ronald Carter and Michael McCarthy
3.	George Orwell Essays, Penguin Classics

Web Resources

1	http:/www.gradesaver.com/George-orwell-essays/study/summary
2	O' Henry. A Retrieved Reformation. https://americanenglish.state.gov/files/ae/resource_files/a-retrieved-reformation.pdf
	Maya Angelou. Phenomenal Woman. https://www.poetryfoundation.org/poems/48985/phenomenal-woman
3	The Quality of Mercy, https://poemana1ysis.com
4	https://www'.oxfordscho1ar1yeditions.coin/disp1ay/10.1093/actrade/9780199235742.book.1/actrade-9780199235742-div1-106- William Hazilitt

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	3	2
CO2	2	3	3	3	2	3	3	2	2	2
CO3	3	3	3	2	3	3	3	2	3	2
CO4	3	3	3	3	3	3	3	2	2	2
CO5	3	2	3	3	3	3	3	2	2	3

3 – Strong, 2 – Medium, 1 – Low

Mapping with Programme Specific Outcomes:

CO /PO	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3
CO2	3	3	3	3
CO3	3	3	3	3
CO4	3	3	3	3
CO5	3	3	3	3
Weightage	15	15	15	15
Weighted percentage of Course Contribution to Pos	3.0	3.0	3.0	3.0

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	CIA	Ext	Total
									Marks		
CC7	Java Programming	Core	5	-	-	-	5	5	25	75	100

Learning Objectives	
LO1	To provide fundamental knowledge of object-oriented programming
LO2	To equip the student with programming knowledge in Core Java from the basics up.
LO3	To enable the students to use AWT controls, Event Handling and Swing for GUI.

LO4	To provide fundamental knowledge of object-oriented programming.
LO5	To equip the student with programming knowledge in Core Java from the basics up.

UNIT	Contents	No. of Hours
I	**Introduction:** Review of Object Oriented concepts – History of Java – Java buzzwords – JVM architecture - Datatypes - Variables - Scope and life time of variables - arrays - operators – control statements - type conversion and casting - simple java program - constructors - methods - Static block - Static Data – Static Method String and String Buffer Classes.	15
II	**Inheritance**: Basic concepts - Types of inheritance - Member access rules - Usage of this and Super key word - Method Overloading - Method overriding - Abstract classes - Dynamic method dispatch - Usage of final keyword. **Packages**: Definition-Access Protection – Importing Packages. **Interfaces**: Definition– Implementation–Extending Interfaces. **Exception Handling**: *try – catch- throw - throws – finally* – Built-in exceptions - Creating own Exception classes.	15

III	**Multithreaded Programming**: Thread Class - Runnable interface –Synchronization–Using synchronized methods– Using synchronized statement- Inter thread Communication –Deadlock. **I/O Streams:** Concepts of streams - Stream classes- Byte and Character stream - Reading console Input and Writing Console output - File Handling.		15
IV	**AWT Controls:** The AWT class hierarchy - user interface components- Labels - Button - Text Components - Check Box - Check Box Group - Choice - List Box - Panels – Scroll Pane - Menu - Scroll Bar. Working with Frame class - Colour - Fonts and layout managers. **Event Handling:** Events - Event sources - Event Listeners - Event Delegation Model (EDM) - Handling Mouse and Keyboard Events - Adapter classes - Inner classes		15
V	**Swing:** Introduction to Swing - Hierarchy of swing components. Containers - Top level containers - JFrame -		15

	JWindow - JDialog - JPanel - JButton - JToggleButton - JCheckBox - JRadioButton - JLabel,JTextField - JTextArea - JList - JComboBox - JScrollPane.		
	Total		**75**
Course Outcomes		

Course Outcomes	On completion of this course, students will;	
CO1	Understand the basic Object-oriented concepts.Implement the basic constructs of Core Java.	PO1, PO2, PO6
CO2	Implement inheritance, packages, interfaces and exception handling of Core Java.	PO2, PO3, PO8
CO3	Implement multi-threading and I/O Streams of Core Java	PO1, PO3, PO5
CO4	Implement AWT and Event handling.	PO2, PO6
CO5	Use Swing to create GUI.	PO1, PO3, PO6

Text Books:	
1.	Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010

2.	Gary Cornell, *Core Java 2 Volume I – Fundamentals,* Addison Wesley, 1999
References :	
1.	Head First Java, O'Rielly Publications,
2.	Y. Daniel Liang, *Introduction to Java Programming*, 7th Edition, Pearson Education India, 2010
3.	P.Rizwan Ahmed, Java Programming, 3rd Edition, Margham Publications, 2017
Web Resources	
1.	https://javabeginnerstutorial.com/core-java-tutorial
2.	http://docs.oracle.com/javase/tutorial/
3.	https://www.coursera.org/

Mapping with Programme Outcomes:

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	2
CO2	3	3	3	2	2	3

CO3	2	2	1	3	3	3
CO4	3	3	3	3	3	2
CO5	3	3	3	3	3	1
Weightage of course contributed to each PSO	14	14	13	14	14	11

S-Strong-3   M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	CIA	External	Total
										Marks	
CC8	**Java Programming Lab**	Core	-	-	4	-	5	5	25	75	100

<table>
<tr><td colspan="2" align="center">Learning Objectives</td></tr>
<tr><td>LO1</td><td>To provide fundamental knowledge of object-oriented programming.</td></tr>
<tr><td>LO2</td><td>To equip the student with programming knowledge in Core Java from the basics up.</td></tr>
<tr><td>LO3</td><td>To enable the students to know about Event Handling .</td></tr>
<tr><td>LO4</td><td>To enable the students to use String Concepts.</td></tr>
<tr><td>LO5</td><td>To equip the student with programming knowledge in to create GUI using AWT controls.</td></tr>
</table>

EXCERCISE	Details	
1	Write a Java program that prompts the user for an integer and then prints out all the prime numbers up to that Integer	
2	Write a Java program to multiply two given matrices.	
3	Write a Java program that displays the number of characters, lines and words in a text	
4	Generate random numbers between two given limits using Random class and print messages according to the range of the value generated.	

5	Write a program to do String Manipulation using Character Array and perform the following string operations:
	    a. String length
	    b. Finding a character at a particular position
	    c. Concatenating two strings	

6	Write a program to perform the following string operations using String class: a. String Concatenation b. Search a substring c. To extract substring from given string
7	Write a program to perform string operations using String Buffer class: a. Length of a string b. Reverse a string c. Delete a substring from the given string
8	Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
9	Write a threading program which uses the same method asynchronously to print the numbers 1to10 using Thread1 and to print 90 to100 using Thread2.
10	Write a program to demonstrate the use of following exceptions. a. Arithmetic Exception b. Number Format Exception c. Array Index Out of Bound Exception d. Negative Array Size Exception
11	Write a Java program that reads on file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes

The value 60 appears to the right spanning these rows.

12	Write a program to accept a text and change its size and font. Include bold italic options. Use frames and controls.		
13	Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. (Use adapter classes).		
14	Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divide by zero.		
15	Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "stop" or "ready" or "go" should appear above the buttons in a selected color. Initially there is no message shown.		
	Total		**60**

Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
1	Understand the basic Object-oriented concepts. Implement the basic constructs of Core Java.	PO1
2	Implement inheritance, packages, interfaces and exception handling of Core Java.	PO1, PO2
3	Implement multi-threading and I/O Streams of Core Java	PO4, PO6
4	Implement AWT and Event handling.	PO4, PO5, PO6
5	Use Swing to create GUI.	PO3, PO6
Text Book		
1	Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010.	

2.	Gary Cornell, *Core Java 2 Volume I – Fundamentals,* Addison Wesley, 1999.

Reference Books	
1.	Head First Java, O'Rielly Publications,
2.	Y. Daniel Liang, *Introduction to Java Programming*, 7th Edition, Pearson Education India, 2010.

Web Resources	
1.	https://www.w3schools.com/java/
2.	http://java.sun.com
3.	http://www.afu.com/javafaq.html

Mapping with Programme Outcomes:

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	2
CO2	3	3	3	2	2	3
CO3	2	2	1	3	3	3
CO4	3	3	3	3	3	2
CO5	3	3	3	3	3	2
Weightage of course contributed to each PSO	14	14	13	14	14	12

S-Strong   M-Medium   L-Low

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
EC4	**Network Security**	Elective	5	-	-	-	3	3	25	75	100
Course Objectives											
CO1	To familiarize on the model of network security, Encryption techniques										
CO2	To understand the concept of Number Theory , theorems										
CO3	To understand the design concept of cryptography and authentication										
CO4	To develop experiments on algorithm used for security										

CO5	To understand about virus and threats, firewalls, and implementation of Cryptography
UNIT	**Contents**

UNIT	Contents	No. of Hours
I	Model of network security – Security attacks, services and attacks – OSI security architecture – Classical encryption techniques – SDES – Block cipher PrinciplesDES – Strength of DES – Block cipher design principles – Block cipher mode of operation – Evaluation criteria for AES – RC4 - Differential and linear cryptanalysis – Placement of encryption function – traffic confidentiality.	15
II	Number Theory – Prime number – Modular arithmetic – Euclid's algorithm - Fermet's and Euler's theorem – Primality – Chinese remainder theorem – Discrete logarithm – Public key cryptography and RSA – Key distribution – Key management – Diffie Hellman key exchange – Elliptic curve cryptography	15
III	Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC – SHA - HMAC – CMAC - Digital signature and authentication protocols – DSS.	15
IV	Authentication applications – Kerberos – X.509 Authentication services - E- mail security – IP security - Web security	15
V	Intruder – Intrusion detection system – Virus and related threats – Countermeasures – Firewalls design principles – Trusted systems – Practical implementation of cryptography and security	15
Total		**75**
Course Outcomes		
Course Outcomes	On completion of this course, students will;	

CO1	Analyze and design classical encryption techniques and block ciphers.	PO1, PO3, PO6
CO2	Understand and analyze public-key cryptography, RSA and other public-key cryptosystems such as Diffie-Hellman Key Exchange, ElGamal Cryptosystem, etc	PO1,PO2,PO3,PO5
CO3	Understand key management and distribution schemes and design User Authentication	PO4, PO5
CO4	Analyze and design hash and MAC algorithms, and digital signatures.	PO1, PO2, PO3, PO6
CO5	Know about Intruders and Intruder Detection mechanisms, Types of Malicious software,	P02, PO6

Reference Text :

1.	William Stallings, "Cryptography & Network Security", Pearson Education, Fourth Edition 2010.

References	
1.	CharlieKaufman,RadiaPerlman,MikeSpeciner,"NetworkSecurity,Privatecommu nicationinpublicworld",PHISecondEdition,2002
2.	Bruce Schneier, Neils Ferguson, "Practical Cryptography", Wiley Dreamtech India Pvt Ltd, First Edition, 2003.
3.	DouglasRSimson"Cryptography– Theoryandpractice",CRCPress,FirstEdition,1995
4.	P.Rizwan Ahmed, Cryptography, Margham Publications, 2014

Web Resources	
1.	https://www.javatpoint.com/computer-network-security
2.	https://www.tutorialspoint.com/information_security_cyber_law/network_securi ty.htm
3.	https://www.geeksforgeeks.org/network-security/

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	3
CO2	3	3	2	3	2	2
CO3	3	2	3	3	3	2
CO4	3	2	3	2	3	3
CO5	2	2	2	2	3	3
Weightage of course contributed to each PSO	14	12	13	13	14	13

S-Strong-3   M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	CIA	External	Total
										Marks	
EC4	**Multimedia Systems**	Elective	2	-	-	-	3	3	25	75	100

	Learning Objectives
LO1	Understand the definition of Multimedia
LO2	To study about the Image File Formats, Sounds Audio File Formats
LO3	Understand the concepts of Animation and Digital Video Containers
LO4	To study about the Stage of Multimedia Project
LO5	Understand the concept of Ownership of Content Created for Project Acquiring

	Talent		
UNIT	**Contents**	**No. of Hours**	**Course Objective**
I	Multimedia Definition-Use Of Multimedia-Delivering Multimedia- Text: About Fonts and Faces - Using Text in Multimedia -Computers and Text Font Editing and Design Tools-Hypermedia and Hypertext.		6
II	Images: Plan Approach - Organize Tools - Configure Computer Workspace -Making Still Images - Color - Image File Formats. Sound: The Power of Sound -DigitalAudio-MidiAudio-Midivs.DigitalAudio-MultimediaSystemSoundsAudio File Formats - Vaughan's Law of Multimedia Minimums - Adding Sound to Multimedia Project		6
III	Animation: The Power of Motion-Principles of Animation-Animation by Computer - Making Animations that Work. Video: Using Video - Working with Video and Displays-Digital Video Containers-Obtaining Video Clips -Shooting and Editing Video		6
IV	Making Multimedia: The Stage of Multimedia Project - The Intangible Needs -The Hardware Needs - The Software Needs - An Authoring Systems Needs-Multimedia Production Team.		6
V	Planning and Costing: The Process of Making Multimedia-Scheduling-Estimating - RFPs and Bid Proposals. Designing and Producing - Content andTalent:AcquiringContent-OwnershipofContentCreatedforProject-AcquiringTalent		6
	Total		**30**

	Course Outcomes	Programme Outcomes
CO	On completion of this course, students will	
CO1	understand the concepts, importance, application and the process of developing multimedia	PO1
CO2	to have basic knowledge and understanding about image related processings	PO1, PO2
CO3	To understand the framework of frames and bit images to animations	PO4, PO6
CO4	Speaks about the multimedia projects and stages of requirement in phases of project.	PO4, PO5, PO6
CO5	Understanding the concept of cost involved in multimedia planning, designing, and producing	PO3, PO6
Text Book		
1	TayVaughan,"Multimedia:MakingItWork",8thEdition,Osborne/McGraw-Hill,2001.	

Reference Books	
1.	RalfSteinmetz&KlaraNahrstedt"MultimediaComputing,Communication& Applications",PearsonEducation,2012.
Web Resources	
1.	https://www.geeksforgeeks.org/multimedia-systems-with-features-or-characteristics/

Mapping with Programme Outcomes:

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	2	2	3	3	3	2
CO2	2	3	2	3	2	1
CO3	1	2	3	3	3	2
CO4	3	2	2	2	1	2
CO5	2	3	1	3	3	3
Weightage of course contributed to each PSO	10	12	11	14	12	10

Strong-3   M-Medium-2   L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst.	CIA	External	Total
									Marks		
SEC6	**WEB DESIGNING**	(SEC)	2	-	-	-	2	2	25	75	100

Learning Objectives	
LO1	Understand the basics of HTML and its components
LO2	To study about the Graphics in HTML
LO3	Understand and apply the concepts of XML and DHTML
LO4	Understand the concept of JavaScript
LO5	To identify and understand the goals and objectives of the Ajax

UNIT	Details	No. of Hours
I	HTML: HTML-Introduction-tag basics- page structure-adding comments working with texts, paragraphs and line break. Emphasizing test- heading and horizontal rules-list-font size, face and color-alignment links-tables-frames.	6
II	Forms & Images Using Html: Graphics: Introduction- How to work efficiently with images in web pages, image maps, GIF animation, adding multimedia, data collection with html forms textbox, password, list box, combo box, text area, tools for building web page front page.	6
III	XML & DHTML: Cascading style sheet (CSS)- what is CSS-Why we use CSS-adding CSS to your web pages-Grouping styles-extensible markup language (XML).	6
IV	Dynamic HTML: Document object model (DCOM)-Accessing HTML & CSS through DCOM Dynamic content styles & positioning- Event bubbling-data binding. JavaScript: Client-side scripting, What is JavaScript, How to develop JavaScript, simple JavaScript, variables, functions, conditions, loops and repetition,	6
V	Advance script, JavaScript and objects, JavaScript own objects, the DOM and web browser environments, forms and validations.	6
colspan="2" **Total**	30

Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
CO1	Develop working knowledge of HTML	PO1, PO3, PO6, PO8
CO2	Ability to Develop and publish Web pages using Hypertext Markup Language (HTML).	PO1,PO2,PO3,PO6
CO3	Ability to optimize page styles and layout with Cascading Style Sheets (CSS).	PO3, PO5
CO4	Ability to develop a java script	PO1, PO2, PO3, PO7
CO5	An ability to develop web application using Ajax.	P02, PO6, PO7
Text Book		
1	Pankaj Sharma, "Web Technology", SkKataria& Sons Bangalore 2011.	
2	Mike Mcgrath, "Java Script", Dream Tech Press 2006, 1st Edition.	
3	Achyut S Godbole&AtulKahate, "Web Technologies", 2002, 2nd Edition.	
Reference Books		

1.	Laura Lemay, RafeColburn , Jennifer Kyrnin, "Mastering HTML, CSS &Javascript Web Publishing", 2016.
2.	DT Editorial Services (Author), "HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)", Paperback 2016, 2nd Edition.
Web Resources	
1.	NPTEL & MOOC courses titled Web Design and Development.
2.	https://www.geeksforgeeks.org

Mapping with Programme Outcomes:

MAPPING TABLE						
CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3
Weightage of course contributed to each PSO	15	12	10	11	12	13

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
SEC7	**Cyber Forensics**	Skill Enha. Course (SEC)	2	-	-	-	2	2	25	75	100

	Learning Objectives
LO1	Understand the definition of computer forensics fundamentals.
LO2	To study about the Types of Computer Forensics Evidence
LO3	Understand and apply the concepts of Duplication and Preservation of Digital Evidence
LO4	Understand the concepts of Electronic Evidence and Identification of Data
LO5	To study about the Digital Detective, Network Forensics Scenario, Damaging Computer Evidence.

UNIT	Contents	No. of Hours
I	**Overview of Computer Forensics Technology:** Computer Forensics Fundamentals: What is Computer Forensics Use of Computer Forensics in Law Enforcement, Computer Forensics Services,. Types of Computer. Forensics Technology: Types of Business Computer Forensic, Technology–Types of Military Computer Forensic Technology–Types of Law Enforcement–Computer Forensic.	6
II	**Computer Forensics Evidence and capture:** Data Recovery: Data Recovery Defined, Data Back–up and Recovery, The Role of Back – up in Data Recovery, The Data –Recovery Solution. Evidence Collection and Data Seizure: Collection Options, Obstacles, Types of Evidence.	6
III	**Duplication and Preservation of Digital Evidence:** Processing steps, Legal Aspects of collecting and Preserving Computer forensic Evidence. Computer image Verification and Authentication: Special needs of Evidential Authentication.	6
IV	**Computer Forensics Analysis:** Discovery of Electronic Evidence: Electronic Document Discovery: A Powerful New Litigation Tool. Identification of Data: Time Travel, Forensic Identification and Analysis of Technical	6
V	**Reconstructing Past Events:** How to Become a Digital Detective, Useable File Formats, Unusable File Formats, Converting Files. Networks: Network Forensics Scenario, a technical approach, Destruction of E–Mail, Damaging Computer Evidence.	6
	Total	**30**

	Course Outcomes	Programme Outcomes
CO	On completion of this course, students will	
CO1	Understand the definition of computer forensics fundamentals.	PO1

CO2	Evaluate the different types of computer forensics technology.	PO1, PO2
CO3	Analyze various computer forensics systems.	PO4, PO6
CO4	Apply the methods for data recovery, evidence collection and data seizure.	PO4, PO5, PO6
CO5	Gain your knowledge of duplication and preservation of digital evidence.	PO3, PO8

Text Book	
1	John R. Vacca, "Computer Forensics: Computer Crime Investigation", 3/E ,Firewall Media, New Delhi, 2002.

Reference Books	
1.	Nelson, Phillips Enfinger, Steuart,"Computer Forensics and Investigations" Enfinger, Steuart, CENGAGE Learning, 2004.
2.	Anthony Sammes and Brian Jenkinson,"Forensic Computing: A Practitioner's Guide", Second Edition, Springer–Verlag London Limited, 2007.
3.	.Robert M.Slade," Software Forensics Collecting Evidence from the Scene of a Digital Crime", TMH 2005.

Web Resources	
1.	https://www.vskills.in
2.	https://www.hackingarticles.in/best-of-computer-forensics-tutorials/

Mapping with Programme Outcomes:

MAPPING TABLE						
CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	1	2	2	2	2
CO2	2	3	2	3	3	1
CO3	3	2	2	3	3	2
CO4	3	3	1	3	3	2
CO5	3	3	2	3	3	3
Weightage of course contributed to each PSO	14	12	9	14	14	10

Strong-3 M-Medium-2 L-Low-1

SEMESTER – V

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	CIA	External	Total
										Marks	
CC9	**Operating Systems**	Core	Y	-	-	-	3	4	25	75	100

Course Objective	
LO1	Understanding the design of the Operating System
LO2	Imparting knowledge on CPU scheduling, Process and Memory Management.
LO3	To code specialized programs for managing overall resources and operations of the computer.
LO4	To study about the concept of Job and processor scheduling
LO5	To learn about the concept of memory organization and multiprogramming

UNIT	Details	No. of Hours
	Introduction: operating system, history (1990s to 2000 and beyond), distributed computing, parallel computation. **Process concepts:** definition of process, process states-Life cycle of a process, process management- process state transitions, process control block(PCB), process operations , suspend and resume, context switching, Interrupts -Interrupt processing, interrupt classes, Inter process communication-signals, message passing.	15
II	**Asynchronous concurrent processes:** mutual exclusion- critical section, mutual exclusion primitives, implementing mutual exclusion primitives, Peterson's algorithm, software solutions to the mutual Exclusion Problem-, n-thread mutual exclusion-Lamports Bakery Algorithm. Semaphores – Mutual exclusion with Semaphores, thread synchronization with semaphores, counting semaphores, implementing semaphores. **Concurrent programming:** monitors, message passing	15
III	**Deadlock and indefinite postponement:** Resource concepts, four necessary conditions for deadlock, deadlock prevention, deadlock avoidance and Dijkstra's Banker's algorithm, deadlock detection, deadlock recovery.	15
IV	**Job and processor scheduling:** scheduling levels, scheduling objectives, scheduling criteria, preemptive vs non-preemptive scheduling, interval timer or interrupting clock, priorities, scheduling algorithms- FIFO scheduling, RR scheduling, quantum size, SJF scheduling, SRT scheduling, HRN scheduling, multilevel feedback queues, Fair share scheduling.	15
V	**Real Memory organization and Management**:: Memory organization, Memory management, Memory hierarchy, Memory management strategies, contiguous vs non-contiguous memory allocation, single user contiguous memory allocation, fixed	

	partition multiprogramming, variable partition multiprogramming, Memory swapping **Virtual Memory organization:** virtual memory basic concepts, multilevel storage organization, block mapping, paging basic concepts, segmentation, paging/segmentation systems. **Virtual Memory Management:** Demand Paging, Page replacement strategies	15
	Total	**75**

	Course Outcomes	**Programme Outcomes**
CO	On completion of this course, students will	
1	Define the fundamentals of OS and identify the concepts relevant to process , process life cycle, Scheduling Algorithms, Deadlock and Memory management	PO1
2	know the critical analysis of process involving various algorithms, an exposure to threads and semaphores	PO1, PO2
3	Have a complete study about Deadlock and its impact over OS. Knowledge of handling Deadlock with respective algorithms and measures to retrieve from deadlock. .	PO4, PO6
4	Have complete knowledge of Scheduling Algorithms and its types.	PO4, PO5, PO6
5	understand memory organization and management	PO3, PO8

Text Book	
1	H.M. Deitel, Operating Systems, Third Edition, Pearson Education Asia, 2011

Reference Books	
1.	William Stallings, Operating System: Internals and Design Principles, Seventh Edition, Prentice-Hall of India, 2012.
2.	A. Silberschatz, and P.B. Galvin., Operating Systems Concepts, Nineth Edition, John Wiley &Sons(ASIA) Pte Ltd.,2012
3.	P.Rizwan Ahmed, Operating System, Margham Publications, 2019

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	-	1	2	-	1
CO 2	2	3	1	2	-	1
CO 3	3	2	-	3	-	1
CO 4	1	3	1	1	3	2
CO 5	3	-	1	3	2	1
WEIGHTAGE OF COURSE CONTRIBUTED TO EACH PSO	12	8	4	11	5	6

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	CIA	External	Total
									Marks		
CC10	Operating System lab	Core	-	-	5	-	4	3	25	75	100

	Learning Objectives	
LO1	. To learn about the basics of UNIX commands and shell programming
LO2	To understand the programming knowledge of scheduling algorithms.
LO3	To understand the working of semaphores in operating system
LO4	To understand how to code various algorithm used in operating system.
LO5	To understand how to code and working procedure of file management concepts in operating system.

	List of Exercises:	No. of
		Hours
	1. Shell Programming. 2. Implement the following CPU scheduling algorithms a) Round Robin b) SJF c) FCFS d) Priority 3. Implement all file allocation strategies a) Sequential b) Indexed c) Linked 4. Implement Semaphore 5. Implement all File Organization Techniques a) Single level directory b) Two level c) Hierarchical d) DAG 6. Implement Bankers Algorithm for Dead Lock Avoidance 7. Implement an Algorithm for Dead Lock Detection 8. Implement e all page replacement algorithms a) FIFO b) LRU c) LFU 9. Implement Shared memory and IPC 10. Implement Paging Technique of memory management. 11. Implement Threading & Synchronization Applications.	3
	Total	
	Course Outcomes	
CO	On completion of this course, students will	
CO1	Able to understand the basics of UNIX commands and shell programming.	
CO2	Able to understand the programming knowledge of scheduling algorithms.	

CO3	Able to understand the working of semaphores in operating system	
CO4	Able to understand how to code various algorithm used in operating system.	
CO5	. Able to understand how to code and working procedure of file management concepts in operating system.	

A. Silberschatz, and P.B. Galvin., Operating Systems Concepts, Nineth Edition, John Wiley &Sons(ASIA) Pte Ltd.,2012
Web resources from NDL Library, E-content from open-source libraries

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	CIA	External	Total
										Marks	
CC11	**Database Management System**	Core	5	-	-	-	3	4	25	75	100

Learning Objectives	
LO1	To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.
LO2	To understood the concepts of data base management system, design simple Database Models
LO3	To learn and understand to write queries using SQL, PL/SQL.
LO4	To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.
LO5	To understood the concepts of data base management system, design simple Database Models

UNIT	Contents	No. of Hours
I	**Database Concepts:** Database Systems - Data vs Information - Introducing the database -File system - Problems with file system – Database systems. Data models - Importance - Basic Building Blocks - Business rules - Evolution of Data models - Degrees of Data Abstraction	15
II	**Design Concepts:** Relational database model - logical view of data-keys -Integrity rules - relational set operators - data dictionary and the system catalog - relationships -data redundancy revisited - indexes - codd's rules. Entity relationship model - ER diagram	15
III	**Normalization of Database Tables**: Database tables and Normalization – The Need for Normalization –The Normalization Process – Higher level Normal Form.	15

		Introduction to SQL: Data Definition Commands – Data Manipulation Commands – SELECT Queries – Additional Data Definition Commands – Additional SELECT Query Keywords – Joining Database Tables.	
IV		**Advanced SQL**: Relational SET Operators: UNION – UNION ALL – INTERSECT - MINUS.SQL Join Operators: Cross Join – Natural Join – Join USING Clause – JOIN ON Clause – Outer Join. **Sub Queries and Correlated Queries**: WHERE – IN – HAVING – ANY and ALL – FROM. SQL Functions: Date and Time Function – Numeric Function – String Function – Conversion Function	15
V		**PL/SQL**: A Programming Language: History – Fundamentals – Block Structure – Comments – Data Types – Other Data Types – Variable Declaration – Assignment operation –Arithmetic operators. **Control Structures and Embedded SQL**: Control Structures – Nested Blocks – SQL in PL/SQL – Data Manipulation – Transaction Control statements. **PL/SQL Cursors and Exceptions**: Cursors – Implicit Cursors, Explicit Cursors and Attributes – Cursor FOR loops – SELECT…FOR UPDATE – WHERE CURRENT OF clause – Cursor with Parameters – Cursor Variables – Exceptions – Types of Exceptions.	15

Total	75

	Course Outcomes	**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Understand the various basic concepts of Data Base System. Difference between file system and DBMS and compare various data models.	PO1
CO2	Define the integrity constraints. Understand the basic concepts of Relational Data Model, Entity-Relationship Model.	PO1, PO2
CO3	Design database schema considering normalization and relationships within database. Understand and construct database using Structured Query Language. Attain a good practical skill of managing and	PO4, PO6

	retrieving of data using Data Manipulation Language (DML)	

CO4	Classify the different functions and various join operations and enhance the knowledge of handling multiple tables.	PO4, PO5, PO6
CO5	Learn to design Data base operations and implement using PL/SQL programs. Learn basics of PL/SQL and develop programs using Cursors, Exceptions	PO3, PO5

Text Book		
1	Coronel, Morris, Rob, "Database Systems, Design, Implementation and Management", Ninth Edition	
2	Nilesh Shah, "Database Systems Using Oracle", 2nd edition, Pearson Education India, 2016	

Reference Books		
1.	Abraham Silberschatz, Henry F.Korth and S.Sudarshan,"Database System Concepts", McGraw Hill International Publication ,VI Edition	
2.	Shio Kumar Singh , "Database Systems ",Pearson publications ,II Edition	
3.	P.Rizwan Ahmed, RDBMS, Margham Publications, 2016	

Web Resources		
1.	Web resources from NDL Library, E-content from open-source libraries	

Mapping with Programme Outcomes:

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3
Weightage of course contributed to each PSO	15	12	10	11	12	13

S-Strong-3   M-Medium-2   L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	CIA	External	Total
										Marks	
CC12	Database Management System lab	Core	-	-	5	-	4	5	25	75	100

	Learning Objectives
LO1	To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.
LO2	To understood the concepts of data base management system, design simple Database models
LO3	To learn and understand to write queries using SQL, PL/SQL.
LO4	To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.
LO5	To understood the concepts of data base management system, design simple Database models

	List of Exercises:	No. of Hours
	I. SQL 　1. DDLCOMMANDS 　2. DMLCOMMANDS 　3. TCLCOMMANDS *II. PL/SQL* 　4. FIBONACCI SERIES 　5. FACTORIAL 　6. STRING REVERSE 　7. SUM OF SERIES 　8. TRIGGER *III. CURSOR* 　9. STUDENT MARK ANALYSIS USING CURSOR *IV. APPLICATION* 　10. LIBRARY MANAGEMENTSYSTEM 　11. STUDENT MARK ANALYSIS	75

	Total			75
	Course Outcomes		**Programme Outcomes**	
CO	On completion of this course, students will			
CO1	Understand the various basic concepts of Data Base System. Difference between file system and DBMS and compare various data models.		PO1	

CO2	Define the integrity constraints. Understand the basic concepts of Relational Data Model, Entity-Relationship Model.	PO1, PO2
CO3	Design database schema considering normalization and relationships within database. Understand and construct database using Structured Query Language. Attain a good practical skill of managing and retrieving of data using Data Manipulation Language (DML)	PO4, PO6
CO4	Classify the different functions and various join operations and enhance the knowledge of handling multiple tables.	PO4, PO5, PO6
CO5	Learn to design Data base operations and implement using PL/SQL programs. Learn basics of PL/SQL and develop programs using Cursors, Exceptions	PO3, PO4

Text Book		
1	Coronel, Morris, Rob, "Database Systems, Design, Implementation and Management", Ninth Edition	
2	Nilesh Shah, "Database Systems Using Oracle", 2nd edition, Pearson Education India, 2016	

Reference Books		
1.	Abraham Silberschatz, Henry F.Korth and S.Sudarshan,"Database System Concepts", McGraw Hill International Publication ,VI Edition	
2.	Shio Kumar Singh , "Database Systems ",Pearson publications ,II Edition	

Web Resources		
1.	Web resources from NDL Library, E-content from open-source libraries	

Mapping with Programme Outcomes:

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	3	3	3	2
CO2	3	3	1	2	2	2
CO3	2	2	3	3	3	3
CO4	2	2	3	3	3	1
CO5	2	3	3	3	3	3
Weightage of course contributed to each PSO	12	12	13	14	14	11

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
EC5	Mobile Computing	Elective	5	-	-	-	3	4	25	75	100

<table>
<tr><td colspan="13" align="center">Learning Objectives</td></tr>
</table>

LO1	To provide the knowledge on wireless communication fundamentals
LO2	To study the basic concepts of medium access control and telecommunication System
LO3	To study a set of wireless networks
LO4	To study about mobile network layer.
LO5	To study the basic concepts of wireless application protocol

UNIT	Contents	No. of Hours	Course Objectives
I	Introduction–Applications–A short History of wireless Communications–Wireless Transmission – Frequencies for Radio transmission–Signals–Antennas–Signal Propagation– Multiplexing–Modulations–Amplitude shift keying–Frequency shift keying–Phase shift keying–Spread Spectrum	15	
II	SDMA–FDMA–TDMA–Fixed TDM–Classical Aloha–CDMA–Global System for Mobile Communications –GPRS–Satellite Systems –Basics – Applications–Broadcast Systems – Digital Audio Broadcasting – Digital Video Broadcasting. learn development of applications	15	
	in mobile computing platform.		
III	Infrared vs. Radio Transmission– Infrastructure Networks–Ad hoc Networks – IEEE 802.11 –System Architecture–Protocol Architecture–Bluetooth–User scenarios–Bluetooth Architecture–Introduction to Wireless ATM –Services–Location Reference Model	15	
IV	Mobile IP–Goals– Assumption–Entities and Terminology–IP Packet delivery – Agent advertisement and discovery–Registration–Tunnelling and encapsulation–Optimizations– Dynamic Host Configuration Protocol (DHCP) –Routing –DSDV–DSR – Alternative Metrics	15	
V	Introduction–Protocol Architecture–Wireless Markup Language (WML)–WML Script– Applications–Wireless Telephony Application (WTA) – Wireless Telephony Application Architecture	15	

		Total	75

Course Outcomes

Course Outcomes	On completion of this course, students will;	
CO1	To understand basic concepts of mobile computing.	PO1, PO3, PO6, PO8
CO2	To learn the basics of mobile telecommunication system	PO1,PO2,PO3,PO6
CO3	To comprehend wireless LAN and cellular systems.	PO3, PO5
CO4	To understand protocols at network and transport layer	PO1, PO2, PO3, PO5
CO5	To understand protocols at network and transport layer	PO2, PO4, PO6

Text Books (Latest Editions)	
1.	"Mobile Communications", Jochen Schiller –PHI/Pearson Education, Second Edition, 2003

References Books (Latest editions)	
1.	"Principles of Wireless Networks", Kaveh Pahalavan, Prasanth Krishnamoorthy, PHI/Pearson Education, 2003
2.	" Mobile Computing", Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal – Tata McGraw Hill Publications, Second edition, 2010
3.	P Rizwan Ahmed, Mobile Computing, Margham Publications, 2014

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3

Weightage of course contributed to Each PSO	15	12	10	11	12	13

S-Strong-3   M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
EC5	**Artificial Intelligence**	Elective	4	-	-	-	3	4	25	75	100

	Course Objective
C1	To learn various concepts of AI Techniques.
C2	To learn various Search Algorithm in AI.
C3	To learn probabilistic reasoning and models in AI.
C4	To learn about Markov Decision Process.
C5	To learn various type of Reinforcement learning.

UNIT	Contents	No. of Hours
I	Introduction: Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree	12
II	Search Algorithms : Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search, A* algorithm, Game Search	12
III	Probabilistic Reasoning : Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference, temporal model, hidden Markov model.	12
IV	Markov Decision process : MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable MDPs.	12
V	Reinforcement Learning: Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference	12

	learning, active reinforcement learning- Q learning	
	Total	**60**
	Course Outcomes	**Programme Outcome**
CO	On completion of this course, students will	

1	Understand the various concepts of AI Techniques.	PO1
2	Understand various Search Algorithm in AI.	PO1, PO2
3	Understand probabilistic reasoning and models in AI.	PO4, PO6
4	Understand Markov Decision Process.	PO4, PO5, PO6
5	Understand various type of Reinforcement learning Techniques.	PO3, PO4

Text Book	
1	Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach" , 3rd Edition, Prentice Hall.
2.	Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill
3.	P.Rizwan Ahmed, Artificial Intelligence, Margham Publications, 2014

Reference Books	
1.	Trivedi, M.C., "A Classical Approach to Artifical Intelligence", Khanna Publishing House, Delhi.
2.	SarojKaushik, "Artificial Intelligence", Cengage Learning India, 2011
3.	David Poole and Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge University Press 2010

Web Resources	
1.	https://github.com/dair-ai/ML-Course-Notes
2.	https://web.cs.hacettepe.edu.tr/~erkut/ain311.f21/index.html
3.	https://www.toolify.ai/?gclid=CjwKCAjwvdajBhBEEiwAeMh1U6tlqU1LXlRFbcghL MZVwICm_4PkIRcDRE-VYq_wTDcuaQeq_bCHnhoCcm4QAvD_BwE

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3
Weightage of course contributed to Each PSO	15	12	10	11	12	13

S-Strong-3   M-Medium-2   L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	CIA	External	Total
									Marks		
EC5	**Big Data Analytics**	Elective	4	-	-	-	3	4	25	75	100

	Course Objective
C1	Understand the Big Data Platform and its Use cases, Map Reduce Jobs
C2	To identify and understand the basics of cluster and decision tree
C3	To study about the Association Rules, Recommendation System
C4	To learn about the concept of stream
C5	Understand the concepts of NoSQL Databases

UNIT	Contents	No. of Hours
I	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 — Map Reduce and YARN — Map Reduce Programming Model	12
II	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.	12
III	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.	12
IV	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 — Case Studies — Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics	12

V	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.		12
	Total		**60**

	Course Outcomes	Programme Outcomes
CO	On completion of this course, students will	
1	Work with big data tools and its analysis techniques.	PO1
2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO2
3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO4, PO5
4	Perform analytics on data streams.	PO3, PO5, PO6
5	Learn NoSQL databases and management.	PO3, PO4

	Text Book
1	Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.

	Reference Books
1.	David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/El sevier Publishers, 2013
2.	EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015.

	Web Resources
1.	https://www.simplilearn.com
2.	https://www.sas.com/en_us/insights/analytics/big-data-analytics.html

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	3	3
CO2	3	3	2	3	3	3
CO3	3	3	3	3	3	2
CO4	3	3	2	3	3	3
CO5	3	3	2	3	3	2
Weightage of course contributed to each PSO	15	14	11	15	15	13

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	CIA	External	Total
										Marks	
EC6	**Computer Networks**	Core	5	-	-	-	3	4	25	75	100

	Course Objective
LO1	To learn the basic concepts of Data communication and Computer network
LO2	To learn about wireless Transmission
LO3	To learn about networking and data link layer.
LO4	To study about Network communication.
LO5	To learn the concept of Transport layer

UNIT	Contents	No. of Hours
I	Introduction – Network Hardware – Software – Reference Models – OSI and TCP/IP Models – Example Networks: Internet, ATM, Ethernet and Wireless LANs - Physical Layer – Theoretical Basis for Data Communication - Guided Transmission Media	15
II	Wireless Transmission - Communication Satellites – Telephone System: Structure, Local Loop, Trunks and Multiplexing and Switching. Data Link Layer: Design Issues – Error Detection and Correction.	15
III	Elementary Data Link Protocols - Sliding Window Protocols – Data Link Layer in the Internet - Medium Access Layer – Channel Allocation Problem – Multiple Access Protocols – Bluetooth.	15
IV	Network Layer - Design Issues - Routing Algorithms - Congestion	15
	Control Algorithms – IP Protocol – IP Addresses – Internet Control Protocols.	
V	Transport Layer - Services - Connection Management - Addressing, Establishing and Releasing a Connection – Simple Transport Protocol – Internet Transport Protocols (ITP) - Network Security: Cryptography	15
	Total	**75**

	Course Outcomes	Programme Outcome
CO	On completion of this course, students will	

CO1	To Understand the basics of Computer Network architecture, OSI and TCP/IP reference models	PO1
CO2	To gain knowledge on Telephone systems using wireless network	PO1, PO2
CO3	To understand the concept of MAC	PO4, PO6
CO4	To analyze the characteristics of Routing and Congestion control algorithms	PO4, PO5, PO6
CO5	To understand network security and define various protocols such as FTP, HTTP, Telnet, DNS	PO3, PO4

Text Book	
1	A. S. Tanenbaum, "Computer Networks", 4th Edition, Prentice-Hall of India, 2008.

Reference Books	
1.	B. A. Forouzan, "Data Communications and Networking", Tata McGraw Hill, 4th Edition, 2017
2.	F. Halsall, "Data Communications, Computer Networks and Open Systems", Pearson Education, 2008
3.	D. Bertsekas and R. Gallagher, "Data Networks", 2nd Edition, PHI, 2008.
4.	Lamarca, "Communication Networks", Tata McGraw- Hill, 2002

Web Resources	
1.	https://en.wikipedia.org/wiki/Computer_network
2.	https://citationsy.com/styles/computer-networks

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	3	2	3
CO2	3	2	2	2	2	2
CO3	3	2	3	3	2	3
CO4	3	2	2	2	2	2
CO5	3	2	2	2	2	3
Weightage of course contributed to each PSO	15	11	11	12	10	13

S-Strong-3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	CIA	External	Total
									Marks		
EC6	**Software Testing**	Elective	Y	-	-	-	3	4	25	75	100

	Learning Objectives
LO1	To study fundamental concepts in software testing
LO2	To discuss various software testing issues and solutions in software unit test, integration and system testing.
LO3	To study the basic concept of Data flow testing and Domain testing.
LO4	To Acquire knowledge on path products and path expressions.
LO5	To learn about Logic based testing and decision tables

UNIT	Contents	No. of Hours
I	Introduction: Purpose–Productivity and Quality in Software– TestingVsDebugging–Model for Testing–Bugs–Types of Bugs – Testing and Design Style.	6
II	Flow / Graphs and Path Testing – Achievable paths – Path instrumentation Application Transaction FlowTesting Techniques.	6
III	Data Flow Testing Strategies - Domain Testing:Domains and Paths – Domains and Interface Testing.	6
IV	Linguistic –Metrics – Structural Metric – Path Products and Path Expressions. Syntax Testing–Formats–Test Cases	6
V	Logic Based Testing–Decision Tables–Transition Testing– States, State Graph, State Testing.	6
	Total	**30**

	Course Outcomes	Program Outcomes
CO	On completion of this course, students will	
CO1	Students learn to apply software testing knowledge and engineering Methods	PO1

CO2	Have an ability to identify the needs of software test automation, and define and develop a test tool to support test automation.	PO1, PO2
CO3	Have an ability understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.	PO4, PO6
CO4	Have basic understanding and knowledge of contemporary issues in software testing, such as component-based software testing problems	PO4, PO5, PO6

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CO5	Have an ability to use software testing methods and modern software testing tools for their testing projects.	PO3, PO8
	Text Book	
1	B.Beizer,"SoftwareTestingTechniques",IIEdn.,DreamTechIndia,NewDelhi,2003.	
2	K.V.K.Prasad,"SoftwareTestingTools",DreamTech.India,NewDelhi,2005	
	Reference Books	
1.	I.Burnstein,2003,"PracticalSoftwareTesting",SpringerInternationalEdn.	
2.	E. Kit, 1995, "Software Testing in the Real World: Improving the Process", PearsonEducation,Delhi.	
3.	P.Rizwan Ahmed, Software Testing, Margham Publications, 2016	
	Web Resources	
1.	https://www.javatpoint.com/software-testing-tutorial	
2.	https://www.guru99.com/software-testing.html	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3
Weightage of course contributed to each PSO	15	12	10	11	12	13

S-Strong-3   M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	CIA	External	Total
								Marks		
EC6	**Cryptography**	Elect	4	-	-	-	3	25	75	100

	Learning Objectives	
LO1	To understand the fundamentals of Cryptography

LO2	To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
LO3	To understand the various key distribution and management schemes.
LO4	To understand how to deploy encryption techniques to secure data in transit across data networks
LO5	To design security applications in the field of Information technology

UNIT	Contents	No. Of. Hours
I	**Introduction:** The OSI security Architecture – Security Attacks – Security Mechanisms – Security Services – A model for network Security.	12
II	**Classical Encryption Techniques:** Symmetric cipher model – **Substitution Techniques:** Caesar Cipher – Monoalphabetic cipher – Play fair cipher – Poly Alphabetic Cipher – Transposition techniques – Stenography	12
III	**Block Cipher and DES:** Block Cipher Principles – DES – The Strength of DES – **RSA:** The RSA algorithm.	12
IV	**Network Security Practices**: IP Security overview - IP Security architecture – Authentication Header. **Web Security**: Secure SocketLayer and Transport Layer Security – Secure Electronic Transaction.	12
V	Intruders – Malicious software – Firewalls.	12
	TOTAL HOURS	**60**

	Course Outcomes	Programme Outcomes
CO	On completion of this course, students will	
CO1	Analyze the vulnerabilities in any computing system and hence be able to design a security solution.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	different cryptographic Operations of symmetric cryptographic	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Apply the different cryptographic operations of public key cryptography	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Apply the various Authentication schemes to simulate different applications.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Understand various Security practices and System security standards	PO1, PO2, PO3, PO4, PO5, PO6

	Textbooks
1	**William Stallings,** "Cryptography and Network Security Principles andPractices".
	Reference Books
1.	**Behrouz A. Foruzan,** "Cryptography and Network Security", Tata McGraw-Hill, 2007.
2	**AtulKahate**, "*Cryptography and Network Security*", Second Edition, 2003,TMH.
3	**V. Arun Kumar**, "*Network Security*", 2011, First Edition,USP.

4.	P.Rizwan Ahmed, Cryptography, Margham Publications, 2014
	Web Resources
1	ps://www.tutorialspoint.com/cryptography/
2	ps://gpgtools.tenderapp.com/kb/how-to/introduction-to-cryptography

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	2	3	2
CO 2	3	2	3	2	3	3
CO 3	3	3	3	2	3	3
CO 4	2	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightage of course contributed to each PSO	14	13	15	12	14	14

Strong-3M-Medium-2   L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	Project with Viva voce		4	-	-		4	25	75	100

	Learning Objectives
LO1	Advance from an intellectually curious student to a creator/maker and an industry professional
LO2	Apply verbal and written communication skills to explain technical problem solving techniques and solutions to an increasingly diverse and global audience
LO3	Collaborate within and across disciplinary boundaries to solve problems
LO4	Apply mathematical and/or statistical methods to facilitate problem solving.
LO5	Exercise computational thinking over the entire software life cycle

Project Work

SL	Area of Work	Maximum Marks
1.	**PROJECT WORK:** (i) Project Proposal and Plan	10
	(ii) Execution of the Project Proposal and Plan / Collection of data, Documentation and Presentation of the report.	40
2.	Viva Voce Examination	25
	TOTAL	**75**

* CIA Marks =25 marks (Project Review 1, Project Review2 and Project Review 3)

	Course Outcomes	
CO	On successful completion of this course, students will be able to	**Programme Outcomes**
1	show leadership skills and learn time management	PO1, PO2, PO3, PO4, PO5, PO6
2	identify various tools to be applied to a specific problem	PO1, PO2, PO3, PO4, PO5, PO6
3	evaluate the reports	PO1, PO2, PO3, PO4, PO5, PO6
4	take part in a team as well as manage it to deliver stunning outcomes	PO1, PO2, PO3, PO4, PO5, PO6
5	assess and develop the individual skills to present and organize projects	PO1, PO2, PO3, PO4, PO5, PO6

Mapping with Programme Outcomes:

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	2
CO2	3	3	3	2	2	3
CO3	2	2	1	3	3	3
CO4	3	3	3	3	3	2
CO5	3	3	3	3	3	1
Weightage of course contributed to each PSO	14	14	13	14	14	11

Guidelines for Documentation of Project

   After completion of the project work, every student will submit a project report which should contain the following:

1. Cover Page (as per annexure 1)
2. Title page (as per annexure 1)
3. Declaration by the Student (as per annexure 2)
4. Certificate by the Guide (as per annexure 3)
5. Acknowledgment (The candidate may thank all those who helped in the execution of the project.)
6. Abstract (It should be in one page and include the purpose of the study; the methodology used and a summary of the major findings.)
7. Table of Contents
8. Detailed description of the project (This should be split in various chapters/sections with each chapter/section describing a project activity in totality). This portion of report should contain all relevant diagrams, tables, flow charts, software programme, print outs, photographs etc., which are properly labeled.
9. Conclusion & Recommendations
10. Appendices
    - Appendices are provided to give supplementary information, which if included in the main text may serve as a distraction and cloud the central theme.
    - Appendices should be numbered using Arabic numerals, e.g. Appendix 1, Appendix 2.
    - Appendices shall carry the title of the work reported and the same title shall be listed in the Contents page also
11. References (The listing of references should be typed 2 spaces below the heading "REFERENCES" in alphabetical order in single spacing left – justified. It should be numbered consecutively (in square [ ] brackets, throughout the text and should be collected together in the reference list at the end of the report. The references should be numbered in the order they are used in the text. The name of the author/authors should be immediately followed by the year and other details).

TITLE OF PROJECT

<Font Size 22><BOLD><Centralized>

A Project Report

<Font Size 14>><BOLD><Centralized>

Submitted by:

<Font Size 14><Italic>><BOLD><Centralized>

NAME OF THE STUDENT (<University Roll Number>)

<Font Size 16>><BOLD><Centralized>

in partial fulfillment for the award of the degree of

<Font Size 14><1.5 line spacing><Italic><BOLD><Centralized>

<Font Size 14><BOLD><Centralized>

BACHELOR OF COMPUTER APPLICATIONS
<Font Size 16>><BOLD><Centralized>

Under the Supervision of
<NAME OF THE SUPERVISOR(s)>

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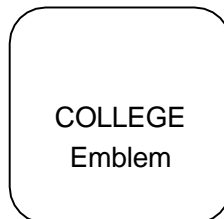
COLLEGE
Emblem

COLLEGE NAME

DEPARTMENT NAME

MONTH & YEAR

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Annexure - 2 CANDIDATE'S DECLARATION

I hereby certify that the project entitled "_____" submitted by

_____ (Student name) & (University Roll no) in partial fulfillment of the

requirement for the award of degree of the B. C.A submitted at _____ (College

Name) is an authentic record of my own work carried out during a period from _____ to _____ under

the guidance of Mr./Dr._____ (Guide name, Designation, Department of Computer Applications). The matter

presented in this project has not formed the basis for the award of any other degree, diploma, fellowship or any

other similar titles.

Signature of the Student Place:

Date:

CERTIFICATE

This is to certify that the project titled "_____ " is the bona fide work carried out by (Student name) & (University Roll no) in partial fulfillment of the requirement for the award of degree of the B.C.A submitted at _____ (College Name) is an authentic record his/her work carried out during a period from _____ to _____under the guidance of Mr./Dr._____Guide name, Designation, Department of Computer Applications & Engineering). The Major Project Viva-Voce Examination has been held on _____(DD/MM/YYYY)

Signature of the Guide   **Signature of the HoD**

Internal Examiner   **External Examiner**

	Subject Name	Category	L	T	P	S		Credits	Marks		
									CIA	External	Total
	Internship / Industrial Training	-	-	-	-	-		2	25	75	100

	Learning Objectives
LO1	Advance from an intellectually curious student to a creator/maker and an industry Professional
LO2	Apply verbal and written communication skills to explain technical problem solving techniques and solutions to an increasingly diverse and global audience
LO3	Collaborate within and across disciplinary boundaries to solve problems
LO4	Apply mathematical and/or statistical methods to facilitate problem solving.
LO5	Exercise computational thinking over the entire software life cycle

Internship / Industrial Training:

The students to undergo 2 weeks of Internship / Industrial Training in the Industry

Sl.NO	Area of Work	Maximum Marks
	a) Work Related performance – Work Attitude/ Academic preparation/ problem solving ability/ Adaptability / Overall Attendance / Progress towards learning goals	10
	b) Organizational skills – Time management skills / Planning skills/ communication skills	20
	c) Relationship with others – Willingness to cooperate with co-works/ Ability to work with supervisor / Acceptance of constructive comments / Ability to take direction	20
	Internship Report / Viva Voce Examination	25
	Total	75

* CIA Marks =25 marks (Internship Review 1, Review2 and Review 3)

Course Outcomes		Programme Outcomes
CO	On successful completion of this course , students will be able to	
1	Find their specific areas of interest , refine their skills and abilities	PO1, PO2, PO3, PO4, PO5, PO6
2	Show a greater sense of self-awareness and appreciation for others	PO1, PO2, PO3, PO4, PO5, PO6
3	Apply problem solving and critical thinking skills to solve real time problem	PO1, PO2, PO3, PO4, PO5, PO6
4	Design various solution approaches for addressing IT business needs.	PO1, PO2, PO3, PO4, PO5, PO6
5	Apply best practices of IT industries by working in the Product or service domain.	PO1, PO2, PO3, PO4, PO5, PO6

Mapping with Programme Outcomes:

MAPPING TABLE						
CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	1	2	2	2	2
CO2	2	3	2	3	3	1
CO3	3	2	2	3	3	2
CO4	3	3	1	3	3	2
CO5	3	3	2	3	3	3
Weightage of course contributed to each PSO	14	12	9	14	14	10

Strong-3 M-Medium-2 L-Low-1

Guidelines for internship

- Internship should be of 2 weeks' duration.
- A student is expected to find internship by himself or herself. However, the institution should assist their students in getting internship in good organizations.
- **The home institution cannot be taken as the place of internship.**
- Internship can be on any topic covered in the syllabus mentioned in the syllabus, not restricted to the specialization.
- Internship can be done, in one of the following, but not restricted to, types of organizations:
    - Software development firms
    - Hardware/ manufacturing firms
    - Any small scale industries, service providers like banks
    - Clinics/ NGOs/professional institutions like that of CA, Advocate etc.
    - Civic Depts. like Ward office/post office/police station/ panchayat.

Guidelines for making Internship Report

A student is expected to make a report based on the internship he or she has done in an organization. It should contain the following:

- **Certificate:** A certificate in the prescribed Performa (given in appendix 1) from the organization where the internship done.
- **Evaluation form:** The form filled by the supervisor or to whom the intern was reporting, in the prescribed Performa (given in appendix 2).
- **Title:** A suitable title giving the idea about what work the student has performed during the internship.
- **Description of the organization:** A small description of 1 to 2 pages on the organization where the student has interned
- **Description about the activities done by the section where the intern has worked**: A description of 2 to 4 pages about the section or cell of the organization where the intern actually worked. This should give an idea about the type of activity a new employee is expected to do in that section of the organization.
- **Description of work allotted and actually done by the intern:** A detailed description of the work allotted and actual work performed by the intern during the internship period. Intern may give a weekly report of the work by him or her if needed. It shall be of around 7 to 10 pages.
- **Self-assessment:** A self-assessment by the intern on what he or she has learnt during the internship period.

It shall contain both technical as well as interpersonal skills learned in the process. It shall be of around 2 to 3 pages.

The internship report may be around 20 to   30 pages and this needs to be submitted to the external examiner at the time of University examination.

Appendix 1

(Proforma for the certificate for internship in official letter head)

This   is   to   certify   that   Mr/Ms_____   of

_____College/Institution worked as an intern as part of her B.Sc. course in Computer Science of Thiruvalluvar University. The particulars of internship are given below:

Internship starting date: _____

Internship ending date:_____

Actual number of days worked:_____

Tentative number of hours worked:_____Hours

Broad area of work:_____

A small description of work done by the intern during the period:

_____

_____

_____

_____

_____

Signature:

Name:

Designation:

Contact number:

Email:

(Seal of the organization)

Appendix 2

(Proforma for the Evaluation of the intern by the supervisor/to whom the intern was reporting in the organization)

Professional Evaluation of intern Name of intern:

College/institution:

[Note: Give a score in the 1-5 scale by putting √ in the respective cells]

S. No	Particular	Excellent	Very Good	Good	Moderate	Satisfactory
1	Attendance					
2	Punctuality					
3	Adaptability					
4	Ability to shoulder responsibility					
5	Ability to work in a team					
6	Written and oral communication skills					
7	Problem solving skills					
8	Ability to grasp new concepts					
9	Ability to complete task					
10	Quality of work Done					

Comments:

Signature:

Name:

Designation:

Contact number:

Email:

(Seal of the organization)

Subject Code	Subject Name	Category	L	T	P	S	Credits	Instruction hour	Marks		
									CIA	External	Total
CC14	**Machine Learning**	Core	5	-	-	-	3	4	25	75	100

	Learning Objectives
LO1	To Learn about Machine Intelligence and Machine Learning applications
LO2	To implement and apply machine learning algorithms to real-world applications
LO3	To identify and apply the appropriate machine learning technique to classification, pattern recognition, optimization and decision problems
LO4	To create instant based learning
LO5	To apply advanced learning

UNIT	Contents	No. Of. Hours
I	**Introduction Machine Learning** - Difference between AI, Machine Learning and Big data. Supervised and unsupervised learning, parametric vs non-parametric models, parametric models for classification and regression- Linear Regression, Logistic Regression, Naïve Bayes classifier, simple non-parametric classifier-K-nearest neighbour, support vector machines	15
II	**Neural networks and genetic algorithms** Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.	15
III	**Bayesian and computational learning** Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.	15
IV	**Instant based learning** K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.	15
V	**Advanced learning** Recommendation systems – opinion mining, sentiment analysis. Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning.	15
	TOTAL HOURS	75

Course Outcomes	**Programme Outcomes**

CO	On completion of this course, students will	
CO1	Appreciate the importance of visualization in the data analytics solution	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Apply structured thinking to unstructured problems	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Understand a very broad collection of machine learning algorithms and problems	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Learn algorithmic topics of machine learning and mathematically deep enough to introduce the required theory	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Develop an appreciation for what is involved in learning from data.	PO1, PO2, PO3, PO4, PO5, PO6
1	Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.	
2	Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning" 2015, MIT Press	

	Reference Books	
1.		EthemAlpaydin, ―Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
2		Stephen Marsland, ―Machine Learning: An Algorithmic Perspective, CRC Press, 2009.

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	2	3
CO 3	3	3	3	3	3	3
CO 4	3	3	2	3	3	3
CO 5	3	3	3	3	3	2

Weightage of course contributed to each PSO	15	15	14	15	14	14

S-Strong-3 M-Medium-2 L-Low-1

128

Subject Code	Subject Name	Category	L	T	P	S	Credits	CIA	External	Total
									Marks	
CC15	MACHINE LEARNING LAB		-	-	5	-	3	25	75	100

Learning Objectives:

To apply the concepts of Machine Learning to solve real-world problems and to implement basic algorithms in clustering & classification applied to text & numeric data

LAB EXERCISES	Required Hour
	75

1. Solving Regression & Classification using Decision Trees

2. Root Node Attribute Selection for Decision Trees using Information Gain

3. Bayesian Inference in Gene Expression Analysis

4. Pattern Recognition Application using Bayesian Inference

5. Bagging in Classification

6. Bagging, boosting applications using Regression Trees

7. Data & Text Classification using Neural Networks

8. Using Weka tool for SVM classification for chosen domain application

9. Data & Text Clustering using K-means algorithm

10. Data & Text Clustering using Gaussian Mixture Models

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
CC16	**Data Analytics using R Programming**	Core	5	-	-	-	4	6	25	75	100
	Course Objective										

C1	To understand the problem solving approaches
C2	To learn the basic programming constructs in R Programming
C3	To learn the basic programming constructs in R Programming
C4	To use R Programming data structures - lists, tuples, and dictionaries.
C5	To do input/output with files in R Programming.

UNIT	Contents	No. of Hours
I	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	15
II	CONTROL STRUCTURES AND VECTORS -Control structures, functions, scoping rules, dates and times, Introduction to Functions, preview of Some Important R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes Vectors: Generating sequences, Vectors and subscripts, Extracting elements of a vector using subscripts, Working with logical subscripts, Scalars, Vectors, Arrays, and Matrices, Adding and Deleting Vector Elements, Obtaining the Length of a Vector, Matrices and Arrays as Vectors Vector Arithmetic and Logical Operations, Vector Indexing, Common Vector Operations	15

III	LISTS- Lists: Creating Lists, General List Operations, List Indexing Adding and Deleting List Elements, Getting the Size of a List, Extended Example: Text Concordance Accessing List Components and Values Applying Functions to Lists, Data Frames, Creating Data Frames, Accessing Data Frames, Other Matrix-Like Operations	15

IV	FACTORS AND TABLES - Factors and Levels, Common Functions Used with Factors, Working with Tables, Matrix/Array-Like Operations on Tables , Extracting a Sub table, Finding the Largest Cells in a Table, Math Functions, Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions for Statistical Distributions R PROGRAMMING .	15
V	OBJECT-ORIENTED PROGRAMMING S Classes, S Generic Functions, Writing S Classes, Using Inheritance, S Classes, Writing S Classes, Implementing a Generic Function on an S Class, visualization, Simulation, code profiling, Statistical Analysis with R, data manipulation	15
	Total	**75**

	Course Outcomes	**Programme Outcomes**
CO	On completion of this course, students will	
1	Work with big data tools and its analysis techniques.	PO1
2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO3
3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO2, PO6
4	Perform analytics on data streams.	PO4, PO5, PO6
5	Learn NoSQL databases and management.	PO5, PO6
	Text Book	
1	Roger D. Peng," R Programming for Data Science ", 2012	
2	Norman Matloff, "The Art of R Programming- A Tour of Statistical Software Design", 2011	

	Reference Books
1.	1. Garrett Grolemund, Hadley Wickham,"Hands-On Programming with R: Write Your Own Functions and Simulations" , 1st Edition, 2014
2.	Venables ,W.N.,andRipley,"S programming", Springer, 2000.

	Web Resources
1.	https://www.simplilearn.com

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	3
CO2	3	3	2	3	2	2
CO3	3	2	3	3	3	2
CO4	3	2	3	2	3	3
CO5	2	3	3	3	3	3
Weightageof coursecontribute dtoeach PSO	14	13	14	14	14	13

 S-Strong- 3 M-Medium-2 L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	CIA	External	Total
CC17	Data Analytics using R Programming Lab	Core	-	-	4	-	4	6	25	75	100

Course Objective	
C1	To understand the problem solving approaches
C2	To learn the basic programming constructs in R Programming
C3	To practice various computing strategies for R Programming -based solutions to real world problems
C4	To use R Programming data structures - lists, tuples, and dictionaries.
C5	To do input/output with files in R Programming.

Sl. No	**Contents**	
1.	Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.	
2.	Program, to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.	
3.	Write a program to find list of even numbers from 1 to n using R- Loops.	
4.	Create a function to print squares of numbers in sequence.	
5.	Write a program to join columns and rows in a data frame using cbind() and rbind() in R.	**60**
6.	Implement different String Manipulation functions in R.	
7.	Implement different data structures in R (Vectors, Lists, Data Frames)	
8	Write a program to read a csv file and analyze the data in the file in R.	
9	Create pie chart and bar chart using R.	

10	10. Create a data set and do statistical analysis on the data using R.		
11	Program to find factorial of the given number using recursive function		
12	Write a R program to count the number of even and odd numbers from array of N numbers.		
	Total		**60**

	Course Outcomes	Program Outcome
CO	On completion of this course, students will	
1	Acquire programming skills in core R Programming	PO1,PO4,PO5
2	Acquire Object-oriented programming skills in R Programming.	PO1, PO4,PO6
3	Develop the skill of designing graphical-user interfaces (GUI) in R Programming	PO1,PO3,PO6
4	Acquire R Programming skills to move into specific branches	PO3,PO4
5		PO1,PO5,PO6
	Text Book	
1	Roger D. Peng," R Programming for Data Science ", 2012	
2	Norman Matloff,"The Art of R Programming- A Tour of Statistical Software Design", 2011	
	Reference Books	
1	Garrett Grolemund, Hadley Wickham,"Hands-On Programming with R: Write Your Own Functions and Simulations" , 1st Edition, 2014	

2.	Venables ,W.N.,andRipley,"S programming", Springer, 2000.
	Web Resources
1.	https://www.simplilearn.com

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	CIA	External	Total
									Marks		
EC7	**Internet of Things and its applications**	Elective	4	-	-	-	3	5	25	75	100

	Course Objective	
C1	Use of Devices, Gateways and Data Management in IoT.
C2	Design IoT applications in different domain and be able to analyze their performance
C3	Implement basic IoT applications on embedded platform
C4	To gain knowledge on Industry Internet of Things
C5	To Learn about the privacy and Security issues in IoT

UNIT	Details	No. of Hours
I	IoT& Web Technology, The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.	12
II	M2M to IoT – A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.	12
III	IoT Architecture -State of the Art – Introduction, State of the art, Architecture. Reference Model- Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture-Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural Views	12
IV	IoT Applications for Value Creations Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and GasIndustry, Opinions on IoT Application and Value for Industry, Home Management	12

V	Internet of Things Privacy, Security and Governance Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security		12
	Total		**60**

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
1	Work with big data tools and its analysis techniques.	PO1
2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO2
3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO4, PO6
4	Perform analytics on data streams.	PO4, PO5, PO6
5	Learn NoSQL databases and management.	PO3, PO5

Text Book	
1	Vijay Madisetti and ArshdeepBahga, "Internet of Things: (A Hands-on Approach)", Universities Press (INDIA) Private Limited 2014, 1st Edition.

Reference Books	
1.	Michael Miller, "The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World", kindle version.
2.	Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", Apress Publications 2013, 1st Edition,.
3	WaltenegusDargie, ChristianPoellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice" 4..CunoPfister, "Getting Started with the Internet of Things", O"Reilly Media 2011
4.	P.Rizwan Ahmed, Internet of Things, Margham Publications, 2017

Web Resources	

1.	https://www.simplilearn.com
2.	https://www.javatpoint.com
3.	https://www.w3schools.com

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	3	3
CO2	3	2	2	3	3	3
CO3	3	2	3	3	3	3
CO4	3	3	2	3	3	3
CO5	3	3	2	3	3	2
Weightage of course contributed to each PSO	15	12	11	15	15	14

S-Strong-3   M-Medium-2   L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
EC7	**Software Project Management**	Elective	4	-	-	-	3	5	25	75	100

<table>
<tr><td colspan="13" align="center">Learning Objectives</td></tr>
</table>

LO1	To define and highlight importance of software project management.
LO2	To formulate and define the software management metrics & strategy in managing projects
LO3	To famialarize in Software Project planning
LO4	Understand to apply software testing techniques in commercial environment

Unit	Contents	No. of Hours
I	Introduction to Competencies - Product Development Techniques - Management Skills - Product Development Life Cycle - Software Development Process and models - The SEI CMM - International Organization for Standardization.	12
II	Managing Domain Processes - Project Selection Models - Project Portfolio Management - Financial Processes - Selecting a Project Team - Goal and Scope of the Software Project - Project Planning - Creating the Work Breakdown Structure - Approaches to Building a WBS - Project Milestones - Work Packages - Building a WBS for Software.	12
III	Tasks and Activities - Software Size and Reuse Estimating - The SEI CMM - Problems and Risks - Cost Estimation - Effort Measures - COCOMO: A Regression Model - COCOMO II - SLIM: A Mathematical Model - Organizational Planning - Project Roles and Skills Needed.	12
IV	Project Management Resource Activities - Organizational Form and Structure - Software Development Dependencies - Brainstorming - Scheduling Fundamentals - PERT and CPM - Leveling Resource Assignments - Map the Schedule to a Real Calendar - Critical Chain Scheduling.	12
V	Quality: Requirements – The SEI CMM - Guidelines - Challenges - Quality Function Deployment - Building the Software Quality Assurance - Plan - Software Configuration Management: Principles - Requirements - Planning and Organizing - Tools - Benefits - Legal Issues in Software - Case Study	12
	TOTAL	60

CO	Course Outcomes
CO1	Understand the principles and concepts of project management
CO2	Knowledge gained to train software project managers
CO3	Apply software project management methodologies.
CO4	Able to create comprehensive project plans
CO5	Evaluate and mitigate risks associated with software development process

	Textbooks
1	Robert T. Futrell, Donald F. Shafer, Linda I. Safer, "Quality Software Project Management", Pearson Education Asia 2002.

	Reference Books
1.	PankajJalote, "Software Project Management in Practice", Addison Wesley 2002.
2.	Hughes, "Software Project Management", Tata McGraw Hill 2004, 3rd Edition.
3.	P.Rizwan Ahmed, Software Project Management, Margham Publications, 2017

NOTE: Latest Edition of Textbooks May be Used

	Web Resources
1.	Software Project Management e-resources from Digital libraries
2.	www.smartworld.com/notes/software-project-management

Mapping with Programme Outcomes:

MAPPING TABLE						
CO/PSO	PSO1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	2	2
CO2	3	1	3	2	2	2
CO3	2	3	2	3	3	3
CO4	3	3	2	3	3	2
CO5	2	2	2	3	3	3
Weightage of course contributed to each PSO	13	11	10	13	13	12

S-Strong-3   M-Medium-2   L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
EC7	**Enterprise Resource Planning**	Elective	2	-	-	-	3	5	25	75	100

<table>
<tr><td colspan="2" align="center">Learning Objectives</td></tr>
<tr><td>LO1</td><td>To understand the basic concepts, Evolution and Benefits of ERP.</td></tr>
<tr><td>LO2</td><td>To know the need and Role of ERP in logical and Physical Integration.</td></tr>
<tr><td>LO3</td><td>Identify the important business functions provided by typical business software such as enterprise resource planning and customer relationship Management</td></tr>
<tr><td>LO4</td><td>To train the students to develop the basic understanding of how ERP enriches the business organizations in achieving a multidimensional growth</td></tr>
<tr><td>LO5</td><td>To aim at preparing the students technological competitive and make them ready to self-upgrade with the higher technical skills</td></tr>
</table>

UNIT	Details	No. of Hours
I	ERP Introduction, Benefits, Origin, Evolution and Structure: Conceptual Model of ERP, the Evolution of ERP, the Structure of ERP, Components and needs of ERP, ERP Vendors; Benefits & Limitations of ERP Packages.	6
II	Need to focus on Enterprise Integration/ERP; Information mapping; Role of common shared Enterprise database; System Integration, Logical vs. Physical System Integration, Benefits & limitations of System Integration, ERP's Role in Logical and Physical Integration. Business Process Reengineering, Data ware Housing, Data Mining, Online Analytic Processing (OLAP), Product Life Cycle Management (PLM), LAP, Supply chain Management.	6
III	ERP Marketplace and Marketplace Dynamics: Market Overview, Marketplace Dynamics, the Changing ERP Market. ERP-Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications. Cloud and Open Source, Quality Management, Material Management, Financial Module, CRM and Case Study.	6
IV	ERP Implementation Basics, ERP implementation Strategy, ERP Implementation Life Cycle ,Pre- Implementation task, Role of SDLC/SSAD, Object Oriented Architecture,	6

	Consultants, Vendors and Employees.	
V	ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture. Using ERP tool: either SAP or ORACLE format to case study.	6

		Total	30
		Course Outcomes	
Course Outcomes	On completion of this course, students will;		
CO1	Understand the basic concepts of ERP.		PO1, PO2, PO6
CO2	Identify different technologies used in ERP		PO2, PO3, PO4
CO3	Understand and apply the concepts of ERP Manufacturing Perspective and ERP Modules		PO1, PO3, PO6
CO4	Discuss the benefits of ERP		PO2, PO6
CO5	Apply different tools used in ERP		PO1, PO3, PO5

Reference Text :	
1.	Enterprise Resource Planning – Alexis Leon, Tata McGraw Hill.
2.	Enterprise Resource Planning – Diversified by Alexis Leon, TMH.

References :	
1.	Enterprise Resource Planning – Ravi Shankar & S. Jaiswal , Galgotia
2.	P.Rizwan Ahmed, Enterprise Resource Planning, Margham Publications, 2014

Web Resources	
1.	1. https://www.tutorialspoint.com/management_concepts/enterprise_resource_planning.htm
2.	1. https://www.saponlinetutorials.com/what-is-erp-systems-enterprise-resource-planning/
3.	1. https://www.guru99.com/erp-full-form.html
4.	2. https://www.oracle.com/in/erp/what-is-erp/

Mapping with Programme Outcomes:

MAPPING TABLE						
CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	2	2	2
CO2	3	3	2	2	3	2
CO3	3	3	3	3	3	2
CO4	3	3	3	3	3	2
CO5	3	3	3	2	2	3
Weightage of course contributed to each PSO	15	15	14	12	13	11

Subject Code	Subject Name	Category	L	T	P	S	Credits	CIA	External	Total
									Marks	
EC8	**NATURAL LANGUAGE PROCESSING**	Elect	4	-	-		3	25	75	100

	Learning Objectives
LO1	To understand approaches to syntax and semantics in NLP.
LO2	To learn natural language processing and to learn how to apply basic algorithms in this field.
LO3	To understand approaches to discourse, generation, dialogue and summarization within NLP.
LO4	Toget acquainted with the algorithmic description of the main language levels: morphology, syntax, semantics, pragmatics etc.
LO5	To understand current methods for statistical approaches to machine translation.

UNIT	Contents	No. Of. Hours
I	**Introduction :** Natural Language Processing tasks in syntax, semantics, and pragmatics – Issue- Applications – The role of machine learning – Probability Basics –Information theory – Collocations -N-gram Language Models – Estimating parameters and smoothing – Evaluating language models.	**12**
II	**Word level and Syntactic Analysis:** Word Level Analysis: Regular Expressions-Finite- State Automata-Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging.Syntactic Analysis: Context-free Grammar-Constituency- Parsing-Probabilistic Parsing.	**12**
III	**Semantic analysis and Discourse Processing:** Semantic Analysis: Meaning Representation-Lexical Semantics- Ambiguity-Word Sense Disambiguation. Discourse Processing: cohesion-Reference Resolution- Discourse Coherence and Structure.	**12**
IV	**Natural Language Generation:** Architecture of NLG Systems- Generation Tasks and Representations- Application of NLG. Machine Translation: Problems in Machine Translation. Characteristics of Indian Languages- Machine Translation Approaches-Translation involving Indian Languages.	**12**
V	**Information retrieval and lexical resources:** Information Retrieval: Design features of Information Retrieval Systems-Classical, Non-classical, Alternative Models of Information Retrieval – valuation Lexical Resources: WorldNet-Frame NetStemmers-POS Tagger- Research Corpora SSAS.	**12**
Total hours		**60**

	Course Outcomes	Programme Outcomes
CO	On completion of this course, students will	
CO1	Describe the fundamental concepts and techniques of natural language processing. Explain the advantages and disadvantages of different NLP technologies and their applicability in different business situations.	PO1, PO2, PO3, PO4, PO5, PO6

CO2	Distinguish among the various techniques, taking into account the assumptions, strengths, and weaknesses of each Use NLP technologies to explore and gain a broad understanding oftext data.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Use appropriate descriptions, visualizations, and statistics to communicate the problems and their solutions. Use NLP methods to analyse sentiment of a text document.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Analyze large volume text data generated from a range of real-world applications. Use NLP methods to perform topic modelling.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Develop robotic process automation to manage business processes and to increase and monitor their efficiency and effectiveness. Determine the framework in which artificial intelligence and the Internet of things may function, including interactions with people, enterprise functions, and environments.	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks

1	Daniel Jurafsky, James H. Martin, "Speech & language processing", Pearson publications.
2	Allen, James. Natural language understanding. Pearson, 1995.

Reference Books

1.	Pierre M. Nugues, "An Introduction to Language Processing with Perl and Prolog",Springer

Web Resources

1.	https://en.wikipedia.org/wiki/Natural_language_processing
2.	https://www.techtarget.com/searchenterpriseai/definition/natural-language-processing-NLP

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	2	3	3	3	2	3
CO 3	3	3	3	3	3	3
CO 4	3	2	3	3	2	3
CO 5	3	3	3	3	3	3
Weightage of course contributed to each PSO	14	14	15	15	13	15

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	CIA	External	Total
										Marks	
EC8	**Cloud Computing**	Elective	4	-	-	-	3	5	25	75	100

Course Objective	
LO1	Learning fundamental concepts and Technologies of Cloud Computing.
LO2	Learning various cloud service types and their uses and pitfalls.
LO3	To learn about Cloud Architecture and Application design.
LO4	To know the various aspects of application design, benchmarking and security on the Cloud.
LO5	To learn the various Case Studies in Cloud Computing.

UNIT	Contents	No. of Hours
I	Introduction to Cloud Computing: Definition of Cloud Computing – Characteristics of Cloud Computing – Cloud Models – Cloud Service Examples – Cloud-based Services and Applications. Cloud Concepts and Technologies: Virtualization – Load balancing – Scalability and Elasticity – Deployment – Replication – Monitoring – Software Defined Networking – Network Function Virtualization – MapReduce – Identity and Access Management – Service Level Agreements – Billing.	12
II	Cloud Services Compute Services: Amazon Elastic Computer Cloud - Google Compute Engine - Windows Azure Virtual Machines Storage Services: Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage Database Services: Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database - Windows Azure Table Service Application Services: Application Runtimes and Frameworks - Queuing Services - Email Services - Notification Services - Media Services Content Delivery Services: Amazon CloudFront - Windows Azure Content Delivery Network	12

III	**Cloud Application Design:** Introduction – Design Consideration for Cloud Applications – Scalability – Reliability and Availability – Security – Maintenance and Upgradation – Performance – Reference Architectures for Cloud Applications – Cloud Application Design Methodologies: Service Oriented Architecture (SOA), Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller (MVC), RESTful Web Services – Data Storage Approaches: RelationalApproach (SQL), Non- RelationalApproach (NoSQL).	12
IV	**Cloud Application Benchmarking and Tuning:** Introduction to Benchmarking – Steps in Benchmarking – WorkloadCharacteristics – Application Performance Metrics – Design Consideration for Benchmarking Methodology – Benchmarking Tools and Types of Tests – Deployment Prototyping.	12
V	**Case Studies:** Cloud Computing for Healthcare – Cloud Computing for EnergySystems - Cloud Computing for Transportation Systems - Cloud Computing for Manufacturing Industry - Cloud Computing for Education.	12
	Total	**60**

	Course Outcomes	Programme Outcome
CO	On completion of this course, students will	
CO 1	Understand the fundamental concepts and Technologies in Cloud Computing.	PO1
CO 2	Able to understand various cloud service types and their uses and pitfalls.	PO1, PO2
CO 3	Able to understand Cloud Architecture and Application design.	PO4, PO5
CO 4	Understand the various aspects of application design, benchmarking and security in the Cloud.	PO4, PO5, PO6
CO 5	Understand various Case Studies in Cloud Computing.	PO3, PO6

	Text Book
1	ArshdeepBahga, Vijay Madisetti, *Cloud Computing – A Hands On Approach*, Universities Press (India) Pvt. Ltd., 2018

	Reference Books
1.	Anthony T Velte, Toby J Velte, Robert Elsenpeter, *Cloud Computing: A Practical*

	Approach, Tata McGraw-Hill, 2013.
2.	Barrie Sosinsky, *Cloud Computing Bible*, Wiley India Pvt. Ltd., 2013.
3.	David Crookes, *Cloud Computing in Easy Steps*, Tata McGraw Hill, 2015.
4.	Dr. Kumar Saurabh, *Cloud Computing*, Wiley India, Second Edition 2012.
Web Resources	
1.	https://en.wikipedia.org/wiki/Cloud_computing
2.	https://link.springer.com/chapter/10.1007/978-3-030-34957-8_7
3.	https://webobjects.cdw.com/webobjects/media/pdf/solutions/cloud-computing/121838-CDW-Cloud-Computing-Reference-Guide.pdf

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	3	2
CO2	3	3	2	3	3	2
CO3	3	3	3	3	3	2
CO4	3	3	2	3	3	2
CO5	3	3	2	3	3	2
Weightage of course contributed to each PSO	**15**	**14**	**11**	**15**	**15**	**10**

 S-Strong-3   M-Medium-2   L-Low-1

Subject Code	Subject Name	Category	L	T	P	S		Inst. Hours	Marks		
									CIA	External	Total
EC8	**Robotics and its Applications**	Elective	4	-	-	-	3	6	25	75	100

	Learning Objectives	
LO1	To understand the robotics fundamentals	
LO2	Understand the sensors and matrix methods	
LO3	Understand the Localization: Self-localizations and mapping	
LO4	To study about the concept of Path Planning, Vision system	
LO5	To learn about the concept of robot artificial intelligence	

UNIT	Details	No. of Hours
I	Introduction: Introduction, brief history, components of robotics, classification, workspace, work-envelop, motion of robotic arm, end-effectors and its types, service robot and its application, Artificial Intelligence in Robotics.	12
II	Actuators and sensors :Types of actuators, stepper-DC-servo- and brushless motors- model of a DC servo motor-types of transmissions-purpose of sensor-internal and external sensor-common sensors-encoders tachometers-strain gauge based force torque sensor-proximity and distance measuring sensors Kinematics of robots: Representation of joints and frames, frames transformation, homogeneous matrix, D-H matrix, Forward and inverse kinematics: two link planar (RR) and spherical robot (RRP). Mobile robot Kinematics: Differential wheel mobile robot	12
III	Localization: Self-localizations and mapping - Challenges in localizations – IR based localizations – vision based localizations – Ultrasonic based localizations - GPS localization systems.	12
IV	Path Planning: Introduction, path planning-overview-road map path planning-cell decomposition path planning potential field path planning-obstacle avoidance-case studies Vision system: Robotic vision systems-image representation-object recognition-and categorization-depth measurement- image data compression-visual inspection-software considerations	12

10

V	Application: Ariel robots-collision avoidance robots for agriculture-mining-exploration-underwater-civilian- and military applications-nuclear applications-space Applications-Industrial robots-artificial intelligence in robots-application of robots in material handling-continuous arc welding-spot welding-spray painting-assembly operation-cleaning-etc.		12
	Total		**60**

	Course Outcomes	**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Describe the different physical forms of robot architectures.	PO1
CO2	Kinematically model simple manipulator and mobile robots.	PO1, PO2
CO3	Mathematically describe a kinematic robot system	PO4, PO6
CO4	Analyze manipulation and navigation problems using knowledge of coordinate frames, kinematics, optimization, control, and uncertainty.	PO4, PO5, PO6
CO5	Program robotics algorithms related to kinematics, control, optimization, and uncertainty.	PO3, PO8
	Text Book	
1	RicharedD.Klafter. Thomas Achmielewski and MickaelNegin, Robotic Engineering and Integrated Approach, Prentice Hall India-Newdelhi-2001	

2	SaeedB.Nikku, Introduction to robotics, analysis, control and applications, Wiley-India, 2 nd edition 2011	
	Reference Books	
1.	Industrial robotic technology-programming and application by M.P.Groover et.al, McGrawhill2008	
2.	Robotics technology and flexible automation by S.R.Deb, THH-2009	
	Web Resources	
1.	https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_robotics.html	
2.	https://www.geeksforgeeks.org/robotics-introduction/	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	3	2
CO2	3	3	2	3	3	2
CO3	3	3	3	3	3	2
CO4	3	3	2	3	3	2
CO5	3	3	2	3	3	2
Weightage of course contributed to each PSO	15	14	11	15	15	10

S-Strong-3   M-Medium-2   L-Low-1

10

Subject Code	Subject Name		L	T	P	S				Marks		
		Category					Credits	Inst. Hours	CIA	External	Total	
SEC8	**Open Source Technology**	Skill Enha.Course	C	-	-	-	2	2	25	75	100	

Course Objective	
LO1	Able to Acquire and understand the basic concepts in Java,application of OOPS concepts.
LO2	Acquire knowledge about operators and decision-making statements.
LO3	To Identify the significance and application of Classes, arrays and interfaces and analyzing java arrays
LO4	Understand about the applications of OOPS concepts and analyze overriding and packages through java programs.
LO5	Can Create window-based programming using applet and graphics programming.

UNIT	Details	No. of Hours
I	Open Source – open source vs. commercial software – What is Linux – Free Software – Where I can use Linux - Linux kernel – Linux distributions.	6
II	: Introduction Linux Essential Commands – File System concept – Standard Files –The Linux Security Model – Introduction to Unix – Unix Components Unix Files – FileAttributes and Permission – Standard I/O – Redirection – Pipes and Filters – Grep and Stream Editor	6
III	Introduction - Apache Explained – Starting, Stopping and Restarting Apache –Modifying the Default configuration – Securing Apache – Set user and Group	6
IV	MySQL: Introduction to MySQL – The show databases and table – The USE command –Create Database and Tables – Describe Table – Select, Insert, Update and Delete statement database.	6
V	Introduction –PHP Form processing – Database Access with PHP – MySQL, MySQL Functions – Inserting Records – Selecting Records – Deleting Records – Update Records.	6
	Total	**30**

Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
1	Acquire and understand the basic concepts in Java,application of OOPS concepts.	PO1
2	Acquire knowledge about operators and decision-making statements.	PO1,PO2
3	Identify the significance and application of Classes, arrays and interfaces and analyzing java arrays	PO4,PO6

10

4	Understand about the applications of OOPS concepts and analyze overriding and packages through java programs.	PO4,PO5,PO6
5	Create window-based programming using applet and graphics programming.	PO3,PO8
Text Book		
1	James Lee and Brent Ware "Open Source Web Development with LAMP using	
2	LINUX, Apache, MySQL, Perl and PHP", Dorling Kindersley (India) Pvt. Ltd, 2008.	
3.	P.Rizwan Ahmed, Open Source Programming, Margham Publications, 2020	
Reference Books		
1.	Eric Rosebrock, Eric Filson, "Setting up LAMP: Getting Linux, Apache, MySQL and PHP and working together", John Wiley and Sons, 2004.	
2.	2. Anthony Butcher , "Teach Yourself MySQL in 21 days", 2nd Edition, Sams Publication.	
3.	3. Rich Bower, Daniel Lopez Ridreejo, Alian Liska , "Apache Administrator's Handbook", Sams Publication.	
4.	4. Tammy Fox, "RedHat Enterprise Linux 5 Administration Unleashed", Sams Publication.	

	5. Naramore Eligabette, Gerner Jason, Wrox Press, Wiley Dreamtech Press, "Beginning PHP5, Apache, MySQL Web Development", 2005.
5.	
Web Resources	
1.	Introduction to Open-Source and its benefits - GeeksforGeeks
2.	https://www.bing.com/

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	1	3	2	2	1	1
CO 2	3	1	3	2	3	3
CO 3	3	2	2	-	2	1
CO 4	2	-	3	3	3	1
CO 5	3	3	3	3	3	2
WEIGHTAGE OF COURSE CONTRIBUTED TO EACH PSO	12	9	13	10	12	8

S-Strong-3   M-Medium-2 L-Low-1

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