

SRI MEENAKSHI GOVT. ARTS COLLEGE FOR WOMEN  
(AUTONOMOUS)  
MADURAI – 625 002.

DEPARTMENT OF COMPUTER APPLICATIONS

BACHELOR OF COMPUTER APPLICATIONS

SYLLABUS TO BE INTRODUCED FOR THE ACADEMIC year 2023-24

**2024 – 2025 Batch**

## Introduction

### **BCA (Bachelor of Computer Application)**

Education is the key to development of any society. Role of higher education is crucial for securing right kind of employment and also to pursue further studies in best available world class institutes else where within and outside India. Quality education in general and higher education in particular deserves high priority to enable the young and future generation of students to acquire skill, training and knowledge in order to enhance their thinking, creativity, comprehension and application abilities and prepare them to compete, succeed and excel globally. Learning Outcomes-based Curriculum Framework (LOCF) which makes it student-centric, interactive and outcome-oriented with well-defined aims, objectives and goals to achieve. LOCF also aims at ensuring uniform education standard and content delivery across the state which will help the students to ensure similar quality of education irrespective of the institute and location.

Computer Application is the study of quantity, structure, space and change, focusing on problem solving, application development with wider scope of application in science, engineering, technology, social sciences etc. throughout the world in last couple of decades and it has carved out a space for itself like any other disciplines of basic science and engineering. Computer Application is a discipline that spans theory and practice and it requires thinking both in abstract terms and in concrete terms. Nowadays, practically everyone is a computer user, and many people are even computer programmers. Computer Application can be seen on a higher level, as a science of problem solving and problem solving requires

precision, creativity, and careful reasoning. The ever-evolving discipline of computer Application also has strong connections to other disciplines. Many problems in science, engineering, health care, business, and other areas can be solved effectively with computers, but finding a solution requires both computer science expertise and knowledge of the particular application domain. Computer Application has a wide range of specialties. These include Computer Architecture, Software Systems, Graphics, Artificial Intelligence, Computational Science, and Software Engineering. Drawing from a common core of computer science knowledge, each specialty area focuses on specific challenges. Computer Application is practiced by mathematicians, scientists and engineers. Mathematics, the origins of Computer Science, provides reason and logic. Science provides the methodology for learning and refinement. Engineering provides the techniques for building hardware and software.

Programme Outcome , Programme Specific Out come and Course Outcome

Computer Application is the study of quantity, structure, space and change, focusing on problem solving, application development with wider scope of application in science, engineering, technology, social sciences etc. The key core areas of study in Mathematics include Algebra, Analysis (Real & Complex), Differential Equations, Geometry, and Mechanics.

The Students completing this programme will be able to present Software application clearly and precisely, make abstract ideas precise by formulating them in the Computer languages. Completion of this programme will also enable the learners to join teaching profession, enhance their employability for government jobs, jobs in software industry, banking, insurance and investment sectors, data analyst jobs and job sin various other public and private enterprises.

### **Programme Outcomes(PO) of BCA**

- Scientific aptitude will be developed in Students
- Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the Computer Science & humanities stream.
- Students will become employable; Students will be eligible for career opportunities in education field, Industry, or will be able to opt for entrepreneurship.
- Students will possess basic subject knowledge required for higher studies, professional and applied courses.
- Students will be aware of and able to develop solution oriented approach towards various Social and Environmental issues.
- Ability to acquire in-depth knowledge of several branches of Computer Science and aligned areas. This Programme helps learners in building a solid foundation for higher studies in Computer Science and applications.
- The skills and knowledge gained leads to proficiency in analytical reasoning, which can be utilized in modelling and solving real life problems.
- Utilize computer programming skills to solve theoretical and applied problems by critical understanding ,analysis and synthesis.
- To recognize patterns and to identify essential and relevant aspects of problems.
- Ability to share ideas and insights while seeking and benefitting from knowledge and insight of others.
- Mould the students into responsible citizens in a rapidly changing interdependent society.

The above expectations generally can be pooled into 6 broad categories and can be modified according to

institutional requirements:

PO1: Knowledge

PO2: Problem Analysis

PO3: Design/Development of Solutions

PO4: Conduct investigations of complex problems

PO5: Modern tool usage

PO6: Applying to society

### **Programme Specific Outcomes of B.C. A .Degree Programme in Computer Applications**

PSO1: Think in a critical and logical based manner

PSO2: Familiarize the students with suitable software tools of computer science and industrial applications to handle issues and solve problems in mathematics or statistics and real time application related sciences.

PSO3: Know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand.

PSO4: Understand, formulate, develop programming model with logical approaches to address issues arising in social science, business and other contexts.

PSO5: Acquire good knowledge and understanding to solve specific theoretical and applied problems in advanced areas of Computer science and Industrial statistics.

PO6: Provide students/learners sufficient knowledge and skills enabling them to undertake further studies in Computer Science or Applications or Information Technology and its allied areas on multiple disciplines linked with Computer Science.

PO7: Equip with Computer science technical ability, problem solving skills, creative talent and power of communication necessary for various forms of employment.

PO8: Develop arrange of generic skills helpful in employment, internships & societal activities.

PO9: Get adequate exposure to global and local concerns that provides platform for further exploration into multi-dimensional aspects of computing sciences.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs) can be carried out accordingly, assigning the appropriate level in the grids:

(put tick mark in each row)

PO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
PO1	☑					
PO2		☑				
PO3			☑			
PO4				☑		
PO5					☑	
PO6						☑

## 2. High lights of the Revamped Curriculum

- Student-centric, meeting the demands of industry & society, incorporating industrial components, hands-on training, skill enhancement modules, industrial project, project with viva-voce, exposure to entrepreneurial skills, training for competitive examinations, sustaining the quality of the core components and incorporating application oriented content wherever required.
- The Cores subjects include latest developments in the education and scientific front, advanced programming packages allied with the discipline topics, practical training, devising mathematical models and algorithms for providing solutions to industry/real
- Life situations. The curriculum also facilitates peer learning with advanced mathematical topics in the final semester, catering to the needs of take holders with research aptitude.
- The General Studies and Computer Science based problem solving skills are included as mandatory components in the ‘\_ Training for Competitive Examinations’ course at the final semester, a first of its kind.
- The curriculum is designed so as to strengthen the Industry-Academia interface and provide more job opportunities for the students.
- The Industrial Statistics course is newly introduced in the fourth semester ,to expose the students to real life problems and train the students on designing a mathematical model to provide solutions to the industrial problems.
- The Internship during the second year vacation will help the students gain valuable work experience that connects classroom knowledge to real world experience and to narrow down and focus on the career path.
- Project with viva-voce component in the fifth semester enables the student, application of conceptual knowledge to practical situations. The state of art technologies in conducting a Explain in a scientific and systematic way and arriving at a precise solution is ensured. Such innovative provisions of the industrial training, project and internships will give students an edge over the counterparts in the job market.

State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and interdisciplinary nature are in corporate as Elective courses, covering conventional topics to the latest – Statistics with R Programming, Data Science, Machine learning .Internet of Things and Artificial Intelligence etc..

**Value additions in the Revamped Curriculum:**

Semester	Newly introduced Components	Outcome/Benefits
I	<p><b>Foundation Course</b></p> <p>To ease the transition of learning from higher secondary to higher education, providing an overview of the pedagogy of learning abstract Mathematics and simulating mathematical Concepts to real world.</p>	<ul style="list-style-type: none"> <li>• Instill confidence among students</li> <li>• Create interest for the subject</li> </ul>
I,II,III,IV	<p><b>Skill Enhancement papers</b> (Discipline centric/Generic/Entrepreneurial)</p>	<ul style="list-style-type: none"> <li>• Industry ready graduates</li> <li>• Skilled human resource</li> <li>• Students are equipped with essential skills to make them employable</li> <li>• Training on Computing / Computational skills enable the students gain knowledge and exposure on latest computational aspects</li> <li>• Data analytical skills will enable students gain internships, apprenticeships, fieldwork involving data collection, compilation, analysis etc.</li> <li>• Entrepreneurial skill training will provide an opportunity for independent livelihood</li> <li>• Generates self-employment</li> <li>• Create small scale entrepreneurs</li> <li>• Training to girls leads to women empowerment</li> <li>• Discipline centric skill will improve the Technical know how of solving real life problems using ICT tools</li> </ul>

<b>III,IV,V &amp; VI</b>	Elective papers- An open choice of topics categorized under Generic and Discipline Centric	<ul style="list-style-type: none"> <li>• Strengthening the domain knowledge</li> <li>• Introducing the stakeholders to the State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and interdisciplinary nature</li> <li>• Students are exposed to Latest topics on Computer Science/IT, that require strong mathematical background</li> <li>• Emerging topics in higher education /industry /communication network/health sectoretc .are introduced with hands-on-training, facilitates designing of mathematical models in the respective Sectors</li> </ul>
<b>IV</b>	Industrial Statistics	<ul style="list-style-type: none"> <li>• Exposure to industry moulds students into solution providers</li> <li>• Generates Industry ready graduates</li> <li>• Employment opportunities enhanced</li> </ul>
<b>II year Vacation activity</b>	Internship /Industrial Training	<ul style="list-style-type: none"> <li>• Practical training at the Industry/ Banking Sector /Private/ Public sector organizations / Educational institutions, enable the students gain professional Experience and also become responsible citizens.</li> </ul>
<b>V Semester</b>	Project with Viva–voce	<ul style="list-style-type: none"> <li>• Self-learning is enhanced</li> <li>• Applicationoftheconcepttorealsituationisconceivedresultinginta ngibleoutcome</li> </ul>
<b>VI Semester</b>	Introduction of Professional Competency component	<ul style="list-style-type: none"> <li>• Curriculum design accommodates all category of learners;_MathematicsforAdvancedExplain‘componentwillcom priseofadvancedtopicsinMathematics and allied fields, for those in the peer group/aspiring researchers;</li> <li>• _Training for Competitive Examinations –caters to the needs of the aspirants towards most sought-after services of the nation viz, UPSC, CDS, NDA, Banking Services, CAT, TNPSC group services, etc.</li> </ul>
<b>Extra Credits: For Advanced Learners/Honors degree</b>		<ul style="list-style-type: none"> <li>• To cater to the need so peer learners/research aspirants</li> </ul>

<b>Skills acquired from the Courses</b>	Knowledge, Problem Solving ,Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
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## Credit Distribution for UG Programmes

Sem I	Credit	H	Sem II	Credit	H	Sem III	Credit	H	Sem IV	Credit	H	Sem V	Credit	H	Sem VI	Credit	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	5	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	4	2.5 Elective II Generic/ Discipline Specific	3	4	3.5 Elective III Generic/ Discipline Specific	3	4	4.5 Elective IV Generic/ Discipline Specific	3	3	5.5 Elective V Generic/ Discipline Specific	3	4	6.5 Elective VIII Generic/ Discipline Specific	3	5
1.6 Skill Enhancement Course SEC-1	2	2	2.6 Skill Enhancement Course SEC-2	2	2	3.6 Skill Enhancement Course SEC-4, (Entrepreneurial Skill)	1	1	4.6 Skill Enhancement Course SEC-6	2	2	5.6 Elective VI Generic/ Discipline Specific	3	4	6.6 Extension Activity	1	-
1.7 Skill Enhancement -(Foundation Course)	2	2	2.7 Skill Enhancement Course – SEC-3	2	2	3.7 Skill Enhancement Course SEC-5	2	2	4.7 Skill Enhancement Course SEC-7	2	2	5.7 Value Education	2	2	6.7 Professional Competency Skill	2	2
						3.8 E.V.S.	-	1	4.8 E.V.S	2	1	5.8 Summer Internship /Industrial Training	2				
	<b>23</b>	<b>30</b>		<b>23</b>	<b>30</b>		<b>22</b>	<b>30</b>		<b>25</b>	<b>30</b>		<b>26</b>	<b>30</b>		<b>21</b>	<b>30</b>
<b>Total – 140 Credits</b>																	

**SRI MEENAKSHI GOVT. ARTS COLLEGE FOR WOMEN (AUTONOMOUS),  
MADURAI-2**

**UG TEMPLATE – For B.C.A. Programmes  
SEMESTER-I**

Part	Sub Code	Course Type	Title of the Course	Hrs/ Week	Credits	Exam Hrs	Marks		
							Int	Ext	Total
I	U231A1/ U231H1	LC	Tamil/Hindi	6	3	3	25	75	100
II	U232A1	ELC	English	6	3	3	25	75	100
III	U23CU1	CC1 (T)	Python Programming	5	5	3	25	75	100
III	U23CU2P	CC2 (P)	Practical :Python Programming Lab	3	3	3	25	75	100
III	U23GU58	GEC 1(T)	Discrete Mathematics	4	4	3	25	75	100
III	U23GU71P	GEC 2(P)	Multimedia Lab - Photoshop	2	-	-	-	-	-
IV	U23SEU7P	SEC1	Office Automation	2	2	3	25	75	100
IV	U23FU1	FC	Foundation Course - Structure programming language in C	2	2	3	25	75	100
				30	22				700

**SEMESTER-II**

Part	Sub code	Course Type	Title of the Course	Hrs/ Week	Credits	Exam Hrs	Marks		
							Int	Ext	Total
I	U231A2/ U231H2	LC	Tamil/Hindi	6	3	3	25	75	100
II	U232A2	ELC	English	6	3	3	25	75	100
III	U23CU3	CC3 (T)	Object Oriented Programming Concepts Using C++	5	5	3	25	75	100
III	U23CU4P	CC4 (P)	Practical: C++ Programming Lab	3	3	3	25	75	100
III	U23GU68	GEC 3(T)	Digital Logic Fundamentals	4	4	3	25	75	100
III	U23GU71P	GEC 2(P)	Multimedia Lab -Flash	2	2	3	25	75	100
IV	U23SEU10	SEC2	Multimedia Systems	2	2	3	25	75	100
IV	U23SEU19	SEC3	Web Designing	2	2	3	25	75	100
				30	24				800

**SEMESTER-III**

Part	Sub Code	Course Type	Title of the Course	Hrs/Week	Credits	Exam Hrs	Marks		
							Int	Ext	Total
I	U231A3/ U231H3	LC	Tamil/Hindi	6	3	3	25	75	100
II	U232A3	ELC	English	6	3	3	25	75	100
III	U23CU5	CC5 (T)	Data Structures and Algorithms	5	4	3	25	75	100
III	U23CU6P	CC6 (P)	Practical: Data Structures and Algorithms Lab	3	3	3	25	75	100
III	U23GU72	GEC 4(T)	Database management system	4	4	3	25	75	100
III	U23GU74P	GEC 5(P)	RDBMS -Lab	2	-	-	-	-	-
IV	U23SEU15	SEC4	Entrepreneurial Skill- Enterprise Resource Planning	1	1	3	25	75	100
IV	U23SEU3P	SEC5	Web designing Lab	2	2	3	25	75	100
IV	U23EVS1	E.V.S.	---- <b>Environmental studies</b>	1	--	--	--	--	--
				<b>30</b>	<b>20</b>				<b>700</b>

**SEMESTER-IV**

Part	Sub Code	Course Type	Title of the Course	Hrs/Week	Credits	Exam Hrs	Marks		
							Int	Ext	Total
I	U231A4/ U231H4	LC	Tamil/Hindi	6	3	3	25	75	100
II	U232A4	ELC	English	6	3	3	25	75	100
III	U23CU7	CC7 (T)	Core Industry Module – Programming in Java	4	4	3	25	75	100
III	U23CU8P	CC8(P)	Programming in Java Lab	3	3	3	25	75	100
III	U23GU73	GEC 6(T)	Artificial Intelligence	4	4	3	25	75	100
III	U23GU74P	GEC 5(P)	RDBMS Lab	2	2	3	25	75	100
IV	U23SEU20	SEC6	Software Engineering	2	2	3	25	75	100
IV	U23SEU9	SEC7	Image Processing	2	2	3	25	75	100
IV	U23EVS1	E.V.S.	<b>Environmental studies</b>	1	2	3	25	75	100
				<b>30</b>	<b>25</b>				<b>900</b>
<b>SUMMERINTERNSHIP/INDUSTRIAL TRAINING</b> *Allied Courses are considered as GEC									

**SEMESTER-V**

Part	Sub code	Course Type	Title of the Course	Hrs/ Week	Credits	Exam Hrs	Marks		
							Int	Ext	Total
III	U23CU9	CC9 (T)	Operating System	5	5	3	25	75	100
III	U23CU10	CC10 (T)	ASP.Net Programming	5	5	3	25	75	100
III	U23CU11P	CC11 (P)	ASP.Net Programming Lab	6	3	3	25	75	100
III	U23UPW	CC12	CC/Project with viva	4	4	3	25	75	100
III	U23DU08	DSEC1	Open Source Technologies	4	3	3	25	75	100
III	U23DU19	DSEC2	Datamining and Warehousing	4	3	3	25	75	100
V	U23VE1		Value Education	2	2	3	25	75	100
IV	U23SIU1		Summer Internship/Industry Training	--	2	--	--	--	100
				<b>30</b>	<b>27</b>				<b>800</b>

**SEMESTER-VI**

Part	Sub code	Course Type	Title of the Course	Hrs/ Week	Credits	Exam Hrs	Marks		
							Int	Ext	Total
III	U23CU13	CC13	Computer Networks	6	5	3	25	75	100
III	U23CU14	CC14	Data Analytics using R Programming	6	5	3	25	75	100
III	U23CU15P	CC15(P)	Practical : R Programming Lab	6	3	3	25	75	100
III	U23DU18P	DSEC3	PHP programming lab	5	3	3	25	75	100
III	U23DU15	DSEC4	Cloud Computing	5	3	3	25	75	100
IV			Extension Activity	--	1	--	--	--	100
IV	U23PCU1		Professional Competency Skill – Soft Skill	2	2	3	25	75	100
				<b>30</b>	<b>22</b>				<b>700</b>

**Annexure I****Suggested topics in Core component**

1. Microprocessor and Microcontroller
2. Microprocessor and Microcontroller Lab
3. RDBMS with PL/SQL
4. PL/SQL Lab
5. Machine Learning
6. Machine Learning Lab
7. Network Security
8. Mobile Application Development
9. Mobile Application Development Lab
10. Introduction to Data Science and more.

**Suggested topics in Elective Course****Generic Specific Elective Course - BCA**

S.No	Sub code	Name of the Generic Elective Course	Opted
1.	<b>U23GU58</b>	Discrete Mathematics – I	GEC1
2.	<b>U23GU59</b>	Discrete Mathematics – II	
3	<b>U23GU60</b>	Statistical Methods and its Application-I	
4.	<b>U23GU61</b>	Statistical Methods and its Application-II	
5.	<b>U23GU62</b>	Optimization Techniques	
6.	<b>U23GU63</b>	Nano Technology	
7.	<b>U23GU64</b>	Introduction to Linear Algebra	
8.	<b>U23GU65</b>	Graph Theory and its Application	
9.	<b>U23GU66</b>	Financial Accounting	
10.	<b>U23GU67</b>	Cost and Management Accounting	
11.	<b>U23GU68</b>	<b>Digital Logic Fundamentals</b>	GEC 3
12.	<b>U23GU69</b>	Numerical Methods	
13.	<b>U23GU70</b>	Resource Management	

		Techniques	
14.	<b>U23GU71P</b>	Multimedia Lab	GEC 2
15.	<b>U23GU72</b>	Database Management System	GEC 4
16.	<b>U23GU73</b>	Artificial Intelligence	GEC 6
17.,	<b>U23GU74P</b>	RDBMS Lab	GEC 5

### Skill Enhancement Course

S.No	Sub code	Name of the Skill Enhancement Elective Course	Opted
1.	<b>U23SEU1</b>	Fundamentals of Information Technology	
2.	<b>U23SEU2</b>	Introduction to HTML	
3	<b>U23SEU3p</b>	Web Designing lab	SEC 5
4.	<b>U23SEU4</b>	Software Testing	
5.	<b>U23SEU5</b>	Problem Solving Techniques	
6.	<b>U23SEU6</b>	Understanding Internet	
7.	<b>U23SEU7</b>	Office Automation	SEC 1
8.	<b>U23SEU8</b>	Quantitative Aptitude	
9.	<b>U23SEU9</b>	Image Processing	SEC 3
10.	<b>U23SEU10</b>	Multimedia Systems	SEC 2
11.	<b>U23SEU11</b>	Advanced Excel	
12.	<b>U23SEU12</b>	Biometrics	
13.	<b>U23SEU13</b>	Cyber Forensics	
14.	<b>U23SEU14</b>	Pattern Recognition	
15.	<b>U23SEU15</b>	Enterprise Resource Planning	SEC 7
16.	<b>U23SEU16</b>	Robotics and Applications	
17.,	<b>U23SEU17</b>	Simulation and Modelling	
18.	<b>U23SEU18</b>	Organization Behavior	
19.	<b>U23SEU19</b>	Web design	SEC 4

20.	U23SEU20	Software Engineering	SEC 6
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### Elective course – -Discipline Specific

S.NO	SUB CODE	COURSE	Opted
1	U23DU01	Software Metrics	
2	U23DU02	Natural Language Processing	
3	U23DU03	Analytics for Service Industry	
4	U23DU04	Cryptography	
5	U23DU05	Big Data Analytics	
6	U23DU06	IOT and its Applications	
7	U23DU07	Software Project Management	
8	U23DU08	Open Source Technologies	DSEC 1
9	U23DU09	Information Security	
10	U23DU10	Human Computer Interaction	
11	U23DU11	Fuzzy Logic	
12	U23DU12	Mobile Adhoc Network	
13	U23DU13	Computational Intelligence	
14	U23DU14	Grid Computing	
15	U23DU15	Cloud Computing	DSEC 3
16	U23DU16	Artificial Neural Network	
17	U23DU17	Agile Project Management and more..	
18	U23DU18	PHP Programming	DSEC 4
19	U23DU19	Data Mining and Warehousing	DSEC 2

Part	Course	Total No. of Papers	Hours	Credit	Marks
I	Tamil	4	24	12	400
II	English	4	24	12	400
III	Core Course -Major(CCM)	15	69	60	1500
III	GEC– Elective Course (Allied)	6	24	20	600
III	DSEC –Elective Course	4	18	12	400
III	Internship	1	--	2	100
IV	Skill Enhancement Course (SEC-6 & NM)	7	13	13	700
IV	Foundation Course	1	2	2	100
IV	E.V.S.	1	2	2	100
V	Value Education	1	2	2	100
IV	Extension Activity/NSS/NCC/SPORTS	1	-	1	100
IV	Professional Competency Skill	1	2	2	100
<b>Total</b>		<b>46</b>	<b>180</b>	<b>140</b>	<b>4600</b>

## I. QUESTION PAPER PATTERN FOR EXTERNAL EXAMINATION

**1. Core, Major Elective and Allied Papers**

Section - A	5 compulsory questions ( 1 question from each unit)	5 X 2 = 10 Marks
Section - B	5 questions to be answered under ‘either – or’ pattern ( 2 questions from each unit)	5 X 5 = 25 Marks
Section - C	5 questions to be answered under ‘either – or’ pattern ( 2 questions from each unit)	5 X 8 = 40 Marks
	Total	75 Marks

**2. Skill Based Elective Papers**

Section - A	5 questions to be answered under ‘either – or’ pattern ( 2 question from each unit)	5 X 15 =75 Marks
	Total	75 Marks

**3. Non Major Elective Papers**

Section - A	5 questions to be answered under 'either – or' pattern ( 2 questions from each unit)	5 X 5 = 25 Marks
Section - B	5 questions to be answered under 'either – or' pattern ( 2 questions from each unit)	5 X 10 = 50 Marks
Total		75 Marks

### FIRST YEAR

#### SEMESTER – I

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
U23CU1	Python Programming	Core	5	-	-	-	5	25	75	100
<b>NATURE OF THE COURSE:</b>										
Relevant to Global need		Employability Oriented						Address Professional Ethics		
Relevant to National need		Entrepreneurship Oriented						Address Gender Sensitization		
Relevant to Regional need		Skill Development Oriented						Address Environment and Sustainability		
Relevant to Local need								Address Human values		
<b>Learning Objectives</b>										
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	<b>Basics of Python Programming:</b> 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. <b>Python Arrays:</b> Defining and Processing Arrays – Array methods.	15
II	<b>Control Statements:</b> 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. <b>Jump Statements:</b> break, continue and pass statements.	15
III	<b>Functions:</b> Function Definition – Function Call – Variable Scope and its Lifetime-Return Statement. <b>Function Arguments:</b> Required Arguments, Keyword Arguments, Default Arguments and Variable Length Arguments- Recursion. <b>Python Strings:</b> String operations- Immutable Strings - Built-in String Methods and Functions - String Comparison. <b>Modules:</b> import statement- The Python module – dir() function – Modules and Namespace – Defining our own modules.	15
IV	<b>Lists:</b> Creating a list -Access values in List-Updating values in Lists-Nested lists -Basic list operations-List Methods. <b>Tuples:</b> Creating, Accessing, Updating and Deleting Elements in a tuple – Nested tuples– Difference between lists and tuples. <b>Dictionaries:</b> Creating, Accessing, Updating and Deleting Elements in a Dictionary – Dictionary Functions and Methods - Difference between Lists and Dictionaries.	15
V	<b>Python File Handling:</b> 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
<b>TOTAL HOURS</b>		<b>75</b>
<b>Course Outcomes</b>		<b>Programme Outcomes</b>
CO	On completion of this course, students will	
CO1	<ul style="list-style-type: none"> <li>Learn the basics of python, Do simple programs on python, Learn how to use an array.</li> </ul>	PO1, PO2, PO3, PO4, PO5, PO6
CO2	<ul style="list-style-type: none"> <li>Develop program using selection statement, Work with Looping and jump statements, Do programs on Loops and jump statements.</li> </ul>	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	<ul style="list-style-type: none"> <li>Work with List, tuples and dictionary, Write program using list, tuples and dictionary.</li> </ul>	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
<b>Textbooks</b>		
1	Reema Thareja, “Python Programming using problem solving approach”, First Edition, 2017, Oxford University Press.	
2	Dr. R. Nageswara Rao, “Core Python Programming”, First Edition, 2017, Dream tech Publishers.	

<b>Reference Books</b>	
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.	Kenneth A. Lambert, "Fundamentals of Python – First Programs", CENGAGE Publication.
<b>Web Resources</b>	
1.	<a href="https://www.programiz.com/python-programming">https://www.programiz.com/python-programming</a>
2.	<a href="https://www.guru99.com/python-tutorials.html">https://www.guru99.com/python-tutorials.html</a>
3.	<a href="https://www.w3schools.com/python/python_intro.asp">https://www.w3schools.com/python/python_intro.asp</a>
4.	<a href="https://www.geeksforgeeks.org/python-programming-language/">https://www.geeksforgeeks.org/python-programming-language/</a>
5.	<a href="https://en.wikipedia.org/wiki/Python_(programming_language)">https://en.wikipedia.org/wiki/Python_(programming_language)</a>

### 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
<b>Weightage of course contributed to each PSO</b>	15	10	10	15	13	14

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
U23CU2P	PythonProgramming LAB	Core	-	-	3	-	3	25	75	100

### NATURE OF THE COURSE:

Relevant to Global need		Employability Oriented		Address Professional Ethics	
Relevant to National need		Entrepreneurship Oriented		Address Gender Sensitization	
Relevant to Regional need		Skill Development Oriented		Address Environment and Sustainability	
Relevant to Local need				Address Human values	

<b>Course Objectives:</b>	
<ol style="list-style-type: none"> <li>1. Be able to design and program Python applications.</li> <li>2. Be able to create loops and decision statements in Python.</li> <li>3. Be able to work with functions and pass arguments in Python.</li> <li>4. Be able to build and package Python modules for reusability.</li> <li>5. Be able to read and write files in Python.</li> </ol>	
<b>LAB EXERCISES</b>	<b>Required Hours</b>
<ol style="list-style-type: none"> <li>1. Program using variables, constants, I/O statements in Python.</li> <li>2. Program using Operators in Python.</li> <li>3. Program using Conditional Statements.</li> <li>4. Program using Loops.</li> <li>5. Program using Jump Statements.</li> <li>6. Program using Functions.</li> <li>7. Program using Recursion.</li> <li>8. Program using Arrays.</li> <li>9. Program using Strings.</li> <li>10. Program using Modules.</li> <li>11. Program using Lists.</li> <li>12. Program using Tuples.</li> <li>13. Program using Dictionaries.</li> <li>14. Program for File Handling.</li> </ol>	<b>60</b>
<b>Course Outcomes</b>	
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	-
<b>Weightage of course contributed to each PSO</b>	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	Inst. Hours	Marks		
									CIA	External	Total
U23FU1	Structured Programming Language in C	FC	Y	-	-	-	2	2	25	75	100
<b>Course Objective</b>											
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 Hours	Course Objectives		
I	<b>Overview of C:</b> 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	<b>Decision Making and Branching:</b> Decision making with If, simple IF, IF ELSE, nested IF ELSE , ELSE IF ladder, switch, GOTO statement. <b>Decision Making and Looping:</b> While, Do-While, For, Jumps in loops.							6	CO2		
III	<b>Arrays:</b> Declaration and accessing of one & two-dimensional arrays, initializing two-dimensional arrays, multidimensional arrays.							6	CO3		
IV	<b>Functions:</b> 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	<b>Pointers:</b> 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		
	<b>Total</b>							<b>30</b>			
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,						PO2,PO3,PO6,PO7				

	functions, structures, pointers and files)	
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
<b>Text Book</b>		
1	E. Balagurusamy, Programming in ANSI C, Fifth Edition, Tata McGraw-Hill, 2010.	
<b>Reference Books</b>		
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.	Yashavant Kanetkar, Let Us C, Eighteenth Edition, BPB Publications, 2021	
<b>Web Resources</b>		
1.	<a href="https://codeforwin.org/">https://codeforwin.org/</a>	
2.	<a href="https://www.geeksforgeeks.org/c-programming-language/">https://www.geeksforgeeks.org/c-programming-language/</a>	
3.	<a href="http://en.cppreference.com/w/c">http://en.cppreference.com/w/c</a>	
4.	<a href="http://learn-c.org/">http://learn-c.org/</a>	
5.	<a href="https://www.cprogramming.com/">https://www.cprogramming.com/</a>	

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	1	2	2	2	2	-
CO 2	2	2	2	2	-	2
CO 3	3	2	2	1	1	-
CO 4	3	2	2	1	-	1
CO 5	1	2	2	2	2	3
<b>Weightage of course contributed to each PSO</b>	7	10	10	18	15	6

S-Strong-3    M-Medium-2    L-Low-1

**TITLE OF THE PAPER: DISCRETE MATHEMATICS**

Subject	Subject Name	Category	L	T	P	S	Marks
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Code								Credits	Inst. Hours	CIA	External	Total
U23GU58	<b>DISCRETE MATHEMATICS</b>	GEC	Y	-	-	-	-	4	2	25	75	100

NATURE OF THE COURSE:				
Relevant to Global need		Employability Oriented		Address Professional Ethics
Relevant to National need		Entrepreneurship Oriented		Address Gender Sensitization
Relevant to Regional need		Skill Development Oriented		Address Environment and Sustainability
Relevant to Local need				Address Human values

### PREAMBLE:

To equip the students with applications of discrete mathematics in the field of computer science. To cover sets, logic, proving techniques, combinatorial functions, relations and Graph theory.

COURSE OUTCOME	Unit	Hrs P/S
At the end of the Semester, the Students will be able to		
<b>UNIT 1 CO1:</b> Apply boolean algebra, the language that simplifies communication in the world of computers.	1	12
<b>UNIT 2 CO2:</b> Use formal logic, and will be able to identify interesting outcomes	2	12
<b>UNIT 3 CO3:</b> Implement mathematical structures (matrices, sequences) in real world situations.	3	12
<b>UNIT 4 CO4:</b> Summarize principles of counting and will be able to grasp patterns in data that follows fixed set of rules.	4	12
<b>UNIT 5 CO5:</b> Discuss graph concepts.	5	12

### SYLLABUS

#### UNIT I:

Set Theory: Introduction – Sets – Notation and Description of Sets – Subsets – Venn – Euler Diagrams – Operation on sets – Properties of set operations – Verification of basic laws and algebra by Venn diagram.

#### UNIT II:

Statements and notations, Connectives, Well-formed formulas, Truth Tables, Tautology, Equivalence implication.

**UNIT III:**

Matrices – Special type of Matrices – operations – Inverse of a Matrices – Elementary Transformation – Rank of Matrix – Simultaneous Linear Equation – Eigen values and Eigenvectors– Cayley Hamilton theorem.

**UNIT IV:**

Introduction: What is a graph – Application of graphs – Finite and infinite graphs – Incidence and degree – Isolated vertex, Pendant vertex and null graph. Paths and circuits : Isomorphism – Sub graphs – A puzzle with multicolored cubes – walks, paths and circuits – Connected graphs, disconnected graphs and components – Euler Graphs – Operations on graph – Hamiltonian paths and circuits ( Excluding theorems) – The travelling salesman problem.

**UNIT V:**

Trees and fundamental circuits: Trees – Some properties of trees (Theorem 3.1, 3.2, 3.3 only) - Pendant vertices in a tree – Distance and centers in a tree (Theorem 3.9 only).

**TEXT BOOKS:**

1. Modern algebra & S.Arumugam & Thangapandi Issac, New Gamma Publishing House, Palamkottai.
2. Graph Theory with applications to Engineering and Computer Science , NarsinghDeo, Prentice Hall of India Pvt. Limited, 1999.
3. Discrete Mathematical Structures with applications to Computer Science - Tremblay and Manohar, McGraw Hill,1997.
4. Discrete Mathematics , DrM.K.Venkatraman, Dr.N.Sridharan, S.Chandrasekaran

Unit I : Text Book 3 Chapters- 2.1.1 to 2.1.5

Unit II : Text Book 3 Chapters- 1.1 to 1.2 and 1.21 to 1.2.12

Unit III: Text Book 4 Chapters 6.1 to 6.7

(Unit IV and V: Text Book 2. Chapter 1.1 – 1.5, 2.1 – 2.7, 2.9(Excluding Theorems), 2.10, 3.1 – 3.2 (Theorem 3.1,3.2,3.3 only), 3.3,3.4(Theorem 3.9 only)

UNITS	TOPIC	LECTURE HOURS	MODE OF TEACHING
UNIT 1			
	Set Theory: Introduction – Sets – Notation and Description of Sets – Subsets–	5	Lecture
	– Venn – Euler Diagrams – Operation on sets – Properties of set operations	5	Lecture
	Verification of basic laws and algebra by Venn diagram.	5	Lecture

UNIT 11			
	Statements and Notations, Connectives,	5	Lecture
	Well-formed formulas, Truth Tables,	5	Lecture
	Tautology, Equivalence implication	5	Lecture
UNIT III			
	Matrices – Special type of Matrices – operations – Inverse of a Matrices –	5	Lecture
	Elementary Transformation – Rank of Matrix –	5	Lecture
	Simultaneous Linear Equation – Eigen values and Eigenvectors– Cayley Hamilton theorem	5	Lecture
UNIT IV			
	Introduction: What is a graph – Application of graphs – Finite and infinite graphs – Incidence and degree	5	Lecture
	– Isolated vertex, Pendant vertex and null graph.	5	Lecture
	Paths and circuits : Isomorphism – Sub graphs – A puzzle with multicolored cubes – walks, paths and circuits – Connected graphs, disconnected graphs and components – Euler Graphs – Operations on graph – Hamiltonian paths and circuits ( Excluding theorems) – The travelling salesman problem.	5	Lecture

UNIT V			
	Trees and fundamental circuits: Trees properties of trees (Theorem 3.1, 3.2, 3.3 only) - Pendant vertices in a tree – Distance and centers in a tree (Theorem 3.9 only).		Lecture

Course Outcomes (Cos)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean scores of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	5	4	5	4	2	4	5	3	3	5	4
CO2	4	3	4	4	2	4	5	2	5	3	3.6
CO3	4	4	5	3	5	4	5	2	1	3	3.6
CO4	5	4	4	5	4	4	5	2	1	3	3.7
CO5	5	3	4	2	4	4	5	2	2	2	3.3
Mean Overall Score											3.64

Mapping	1-20%	21-40%	41-60%	61-80%	81-100%
Scale	1	2	3	4	5
Relation	0.0-1.0	1.1-2.0	2.1-3.0	3.1-4.0	4.1-5.0
Quality	Very Poor	Poor	Moderate	High	Very High
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of Pos \& PSOs}}$			Mean Overall Score of COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COs}}$		

BLOOM'S TAXANOMY	INTERNAL	EXTERNAL
KNOWLEDGE	50%	50%
UNDERSTANDING	30%	30%
APPLY	20%	20%

Course Designer:

Department of Computer Applications

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
U23SEU7P	OFFICE AUTOMATION	SEC	-	Y	-	-	2	2	25	75	100

**NATURE OF THE COURSE**

Relevant to Global need		Employability Oriented		Address Professional Ethics	
Relevant to National need		Entrepreneurship Oriented		Address Gender Sensitization	
Relevant to Regional need		Skill Development Oriented		Address Environment and Sustainability	
Relevant to Local need			Address Human values		

**Course Objective**

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	Details	No. of Hours
I	<b>Introductory concepts:</b> Memory unit– CPU-Input Devices: Key board, Mouse and Scanner.Outputdevices:Monitor,Printer.IntroductiontoOperatingsystems&itsfeatures:DOS– UNIX–Windows. IntroductiontoProgrammingLanguages.	6
II	<b>Word Processing:</b> Open, Save and close word document; Editing text – tools, formatting, bullets;SpellChecker - Document formatting – Paragraph alignment, indentation, headers and footers,numbering;printing– Preview,options,merge.	6
III	<b>Spreadsheets:</b> Excel– opening,enteringtextanddata,formatting,navigating;Formulas– entering,handlingand copying;Charts–creating,formatting and printing,analysistables,preparationoffinancialstatements,introductiontoataanalytics.	6
IV	<b>Database Concepts:</b> The concept of data base management system; Data field, records, and files,Sorting and indexing data; Searching records. Designing queries, and reports; Linking of datafiles; Understanding Programming environment in DBMS; Developing menu drive applicationsinquerylanguage(MS–Access).	6

V	<b>Power point:</b> Introduction to Power point - Features – Understanding slide typecasting & viewingslides – creating slide shows. Applying special object – including objects & pictures – Slidetransition– Animationeffects,audioinclusion,timers.	6
<b>Total</b>		<b>30</b>
<b>Course Outcomes</b>		<b>Programme Outcomes</b>
CO	On completion of this course, students will	
1	Possess the knowledge on the basics of computers and its components	PO1,PO2,PO3,PO6,PO8
2	Gain knowledge on Creating Documents, spreadsheet and presentation.	PO1,PO2,PO3,PO6
3	Learn the concepts of Database and implement the Query in Database.	PO3,PO5,PO7
4	Demonstrate the understanding of different automation tools.	PO3,PO4,PO5,PO7
5	Utilize the automation tools for documentation, calculation and presentation purpose.	PO4,PO6,PO7,PO8
<b>Text Book</b>		
1	PeterNorton,“IntroductiontoComputers”–TataMcGraw-Hill.	
<b>Reference Books</b>		
1.	Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, “Microsoft 2003”, Tata McGrawHill.	
<b>Web Resources</b>		
1.	<a href="https://www.udemy.com/course/office-automation-certificate-course/">https://www.udemy.com/course/office-automation-certificate-course/</a>	
2.	<a href="https://www.javatpoint.com/automation-tools">https://www.javatpoint.com/automation-tools</a>	

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	2	2	2	3	3	1
CO 2	3	1	2	3	3	3
CO 3	3	2	1	2	1	3
CO 4	3	3	2	2	2	1
CO 5	2	2	1	3	1	3
<b>Weightage of course contributed to each PSO</b>	13	10	8	13	10	11

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

## SEMESTER II

Title of the Course/ Paper	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
U23CU3	<b>OBJECT ORIENTED PROGRAMMING CONCEPTS USING C++</b>	Core	Y	-	-	-	5	5	25	75	100
<b>NATURE OF THE COURSE</b>											
Relevant to Global need		Employability Oriented		Address Professional Ethics							
Relevant to National need		Entrepreneurship Oriented		Address Gender Sensitization							
Relevant to Regional need		Skill Development Oriented		Address Environment and Sustainability							
Relevant to Local need				Address Human values							
<b>Course Objective</b>											
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										
<b>UNIT</b>	<b>Details</b>										<b>No. of Hours</b>
I	Introduction to C++ - key concepts of Object-Oriented Programming – Advantages – Object Oriented Languages – I/O in C++ - C++ Declarations. Control Structures : - Decision Making and Statements : If ..else, jump, go to, 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 variables and functions – array of objects –friend functions – Overloading member functions – Bit fields and 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, Multipath inheritance – Virtual base Classes – Abstract Classes.										15
IV	Pointers – Declaration – Pointer to Class , Object – this pointer – Pointers to derived classes and Base classes – Arrays – Characteristics – array of classes – Memory models – new and delete operators – dynamic object – Binding, Polymorphism and Virtual Functions.										15
V	Files – File stream classes – file modes – Sequential Read / Write operations – Binary and ASCII Files – Random Access Operation – Templates – Exception Handling - String – Declaring and Initializing string objects – String Attributes – Miscellaneous functions .										15

		<b>Total</b>	<b>75</b>
<b>Course Outcomes</b>		<b>Programme Outcome</b>	
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 learn in real-time problems	PO4 ,PO7	
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	PO7,PO8	
<b>Text Book</b>			
1	E. Balagurusamy, “Object-Oriented Programming with C++”, TMH 2013, 7th Edition.		
<b>Reference Books</b>			
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.		
<b>Web Resources</b>			
1.	<a href="https://alison.com/course/introduction-to-c-plus-plus-programming">https://alison.com/course/introduction-to-c-plus-plus-programming</a>		

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	2	1	-	-	1
CO 2	2	2	2	1	-	-
CO 3	3	1	1	-	1	-
CO 4	1	2	1	2	2	1
CO 5	3	2	1	2	3	2
<b>Weight-age of course contributed to each PSO</b>	12	9	6	5	6	4

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
<b>U23CU4P</b>	<b>C++ PROGRAMMING LAB</b>	Core	-	-	Y	-	3	5	25	75	100

**NATURE OF THE COURSE**

Relevant to Global need		Employability Oriented		Address Professional Ethics	
Relevant to National need		Entrepreneurship Oriented		Address Gender Sensitization	
Relevant to Regional need		Skill Development Oriented		Address Environment and Sustainability	
Relevant to Local need				Address Human values	

**Course Objective**

LO1	Describe the procedural and object oriented paradigm with concepts of streams,
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	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	
<b>S.No</b>	<b>Details</b>	<b>No. of Hours</b>
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: <ul style="list-style-type: none"> <li>• Single Inheritance</li> <li>• Multilevel Inheritance</li> <li>• Multiple Inheritance</li> <li>• Hierarchical Inheritance</li> <li>• Hybrid Inheritance</li> </ul>	
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.	
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.	
<b>Course Outcomes</b>		<b>Programme Outcome</b>
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 ,PO7
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	PO7,PO8
<b>Text Book</b>		
1	E. Balagurusamy, “Object-Oriented Programming with C++”, TMH 2013, 7th Edition.	
<b>Reference Books</b>		
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.	
<b>Web Resources</b>		
1.	<a href="https://alison.com/course/introduction-to-c-plus-plus-programming">https://alison.com/course/introduction-to-c-plus-plus-programming</a>	

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	1	2
CO 2	2	3	3	3	1	2
CO 3	2	3	3	3	1	2
CO 4	2	3	3	3	1	2
CO 5	2	3	3	3	1	2
<b>Weightage of course contributed to each PSO</b>	11	15	15	15	5	10

**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
<b>U23GU68</b>	<b>DIGITAL LOGIC FUNDAMENTALS</b>	GEC	-	-	Y	-	4	5	25	75	100

<b>NATURE OF THE COURSE</b>			
Relevant to Global need		Employability Oriented	Address Professional Ethics
Relevant to National need		Entrepreneurship Oriented	Address Gender Sensitization

Relevant to Regional need		Skill Development Oriented		Address Environment and Sustainability
Relevant to Local need				Address Human values

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	4	2	1	1	-

**PREAMBLE:**

To acquire knowledge in digital logic, combinational logic circuit, flip-flops and registers.  
To discuss about the basic structure of computer, I/O system, memory system and processing unit

**COURSE OUTCOME**

At the end of the Semester, the Students will be able to

	Unit	Hrs P/S
<b>UNIT 1 CO1: Define the basic components of a digital computer and their function</b>	1	12
<b>UNIT 2 CO2: Enhance knowledge on simplifying digital circuits.</b>	2	12
<b>UNIT 3 CO3: Apply Boolean algebra in design of gates.</b>	3	12
<b>UNIT 4 CO4: Simplify and solve the logical expressions.</b>	4	12
<b>UNIT 5 CO5: Design various counters.</b>	5	12

**SYLLABUS****UNIT I:**

**Logic circuits: Binary number systems – OR gates – AND gates – Boolean Algebra – NOR gates – NAND Gates. Circuit Analysis and Design: Boolean laws and theorem – Sum of products – Truth table of Karnaugh map – Pairs, Quads and Octets – Karnaugh Simplification – Don't care conditions - Product of Sums Method – Products of sums simplification.**

**UNIT II:**

**Data Processing Circuits: Multiplexers - Demultiplexers – BCD to Decimal Decoders – Encoders**  
– EX OR Gates. Number system and codes: Binary to decimal Conversion – Decimal to Binary conversion  
– Octal Numbers – Hexa Decimal Numbers.

**UNIT III:**

**Flip Flops: RS Flip flops – D Flipflops – JK Flipflops – JK Master Slave Flip flops. Instruction Codes – Computer Registers – Computer Instruction – Timing and control – Instruction Cycle – Memory reference Instruction – Input – Output and Interrupt – Programming the Basic Computer – Assembly Language.**

**UNIT IV:**

**Central Processing Unit – General Register Organization – Stack Organization – Instruction formats**

– Addressing mode – Data Transfer and manipulation.

**UNIT V:**

**Input-Output organization – Input-Output Interface – Priority Interrupt – DMA – IOP. – Memory Organisation – Memory Hierarchy – Cache memory – Virtual memory.**



Title of the Course/ Paper	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
<b>U23GU71P</b>	<b>MULTIMEDIA LAB</b>	SEC	-	-	Y	-	2	5	25	75	100

**NATURE OF THE COURSE**

Relevant to Global need		Employability Oriented		Address Professional Ethics
Relevant to National need		Entrepreneurship Oriented		Address Gender Sensitization
Relevant to Regional need		Skill Development Oriented		Address Environment and Sustainability
Relevant to Local need				Address Human values

Pedagogy	Hours	PracticalLab	TUTORIAL	ICT
	5	4	1	-

**PREAMBLE:**

1. To manipulate images by various techniques supported by image editing tools.
2. To create 2D animation using guide layer, various tweening methods supported by animation software.
3. To model the object using wireframe and making it to animate and transform.

**COURSE OUTCOME**

At the end of the Semester, the Students will be able to

CO1 : able to develop an animation using Flash

CO2 : Able to develop an application and modification using Photoshop

CO 3 : Able to create a game application using Flash

CO4. Able to design a flex or book cover page designing.

**LAB CYCLE:****Adobe Photoshop – (Image creation and Manipulation):**

1. Working with Selection Tools , Copy, Cut, Paste, Move Tool
2. Working with Lasso, Polygonal Lasso tool , Transform and Opacity options
3. Working with Quick Select Tool (or Magic Wand Tool), Invert Selection Tool
4. Working with Paint Bucket Tool, Color Picker, Brush Tool
5. Working with Layers, Eraser Tool
6. Working with Text and Transform Tool
7. Working with Color Balance
8. Working with Crop and Canvas
9. Working with Clone Stamp Tool, Smudge Tool
10. Working with Filters , effects

**Macromedia FLASH – ( 2D Animation):**

1. Motion Tweening

2. ShapeTweening
3. Working with multipleLayers
4. Animation using guidelayer
5. Animation using Masking Effect

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
U23SEU10	<b>Multimedia Systems</b>	SEC	2	-	-	-	2	2	25	75	100
<b>NATURE OF THE COURSE</b>											

Relevant to Global need		Employability Oriented		Address Professional Ethics	
Relevant to National need		Entrepreneurship Oriented		Address Gender Sensitization	
Relevant to Regional need		Skill Development Oriented		Address Environment and Sustainability	
Relevant to Local need				Address Human values	
<b>Course Objective</b>					
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				
<b>UNIT</b>	<b>Details</b>			<b>No. of Hours</b>	
<b>I</b>	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	
<b>II</b>	Images: Plan Approach-Organize Tools- Configure Computer Workspace-Making Still Images- Color -Image File Formats. Sound: The Power of Sound- Digital Audio-Midi Audio-Midi vs. Digital Audio-Multimedia System Sounds Audio File Formats - Vaughan's Law of Multimedia Minimums- Adding Sound to Multimedia Project			6	
<b>III</b>	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	
<b>IV</b>	Making Multimedia: The Stage of Multimedia Project-The Intangible Needs -The Hardware Needs - The Software Needs-An Authoring Systems Needs-Multimedia Production Team.			6	
<b>V</b>	Planning and Costing: The Process of Making Multimedia-Scheduling- Estimating-RFPs and Bid Proposals. Designing and Producing- Content and Talent: Acquiring Content- Ownership of Content Created for Project- Acquiring Talent			6	

<b>Total</b>		<b>30</b>
<b>CourseOutcomes</b>		<b>ProgrammeOutcomes</b>
<b>CO</b>	Oncompletionofthiscourse,studentswill	
<b>1</b>	understand the concepts, importance, application and the process of developing multimedia	PO1
<b>2</b>	to have basic knowledge and understanding about image related processes	PO1,PO2
<b>3</b>	To understand the framework of frames and bit image to animations	PO4,PO6
<b>4</b>	Speaks about the multimedia projects and stages of requirement in phases of project.	PO4,PO5,PO6
<b>5</b>	Understanding the concept of cost involved in multimedia planning, designing, and producing	PO3,PO8
<b>TextBook</b>		
<b>1</b>	Tay Vaughan, "Multimedia: Making It Work", 8th Edition, Osborne/McGraw-Hill, 2001.	
<b>ReferenceBooks</b>		
<b>1.</b>	Ralf Steinmetz & Klara Nahrstedt "Multimedia Computing, Communication & Applications", Pearson Education, 2012.	
<b>WebResources</b>		
<b>1.</b>	<a href="https://www.geeksforgeeks.org/multimedia-systems-with-features-or-characteristics/">https://www.geeksforgeeks.org/multimedia-systems-with-features-or-characteristics/</a>	

**Mapping with Programme Outcomes:**

<b>CO/PSO</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PSO6</b>
<b>CO1</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>1</b>
<b>CO2</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>1</b>
<b>CO3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>1</b>
<b>CO4</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>1</b>
<b>CO5</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>1</b>
<b>Weightage of course contributed to each PSO</b>	15	11	15	15	8	5

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	Externa l	Total
U23SEU19	WEB DESIGNING	Specific Elective	Y	-	-	-	2	2	25	75	100
<b>NATURE OF THE COURSE</b>											
Relevant to Global need		Employability Oriented		Address Professional Ethics							
Relevant to National need		Entrepreneurship Oriented		Address Gender Sensitization							
Relevant to Regional need		Skill Development Oriented		Address Environment and Sustainability							
Relevant to Local need				Address Human values							
<b>Course Objective</b>											
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										
<b>UNIT</b>	<b>Details</b>					<b>No. of Hours</b>			<b>Course Objective</b>		
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			C1		
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			C2		
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			C3		
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			C4		
V	Advance script, JavaScript and objects, JavaScript own objects, the DOM and web browser environments, forms and validations.					6			C5		
<b>Total</b>					<b>60</b>						
<b>Course Outcomes</b>							<b>Programme Outcome</b>				
CO	On completion of this course, students will										
1	Develop working knowledge of HTML					PO1, PO3, PO6, PO8					

2	Ability to Develop and publish Web pages using Hypertext Markup Language (HTML).	PO1,PO2,PO3,PO6
3	Ability to optimize page styles and layout with Cascading Style Sheets (CSS).	PO3, PO5
4	Ability to develop a java script	PO1, PO2, PO3, PO7
5	An ability to develop web application using Ajax.	P02, PO6, PO7
<b>Text Book</b>		
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.	
<b>Reference Books</b>		
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.	
<b>Web Resources</b>		
1.	NPTEL & MOOC courses titled Web Design and Development.	
2.	<a href="https://www.geeksforgeeks.org">https://www.geeksforgeeks.org</a>	

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	-	2	1	1
CO 2	3	3	-	2	-	1
CO 3	3	3	-	2	2	1
CO 4	3	3	-	2	-	1
CO 5	3	3	3	2	-	1
<b>Weightage of course contributed to each PSO</b>	15	15	3	10	3	4

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

**SECOND YEAR****Semester III**

Title of the Course/ Paper	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	M a r k s		
									CIA	External	Total
U23CU5	<b>DATA STRUCTURES AND ALGORITHMS</b>	Core	Y	-	-	-	4	5	25	75	100
<b>NATURE OF THE COURSE</b>											
Relevant to Global need		Employability Oriented			Address Professional Ethics						
Relevant to National need		Entrepreneurship Oriented			Address Gender Sensitization						
Relevant to Regional need		Skill Development Oriented			Address Environment and Sustainability						
Relevant to Local need					Address Human values						
<b>Course Objective</b>											
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										
<b>UNIT</b>	<b>Details</b>									<b>No. of Hours</b>	
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 post fix expression-Queue ADT-Operations-Circular Queue- Priority Queue- dequeuer 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-									15	

	Separate chaining- Open Addressing-RehashingExtendible Hashing	
	<b>Total</b>	<b>75</b>
<b>Course Outcomes</b>		<b>Programme Outcome</b>
CO	On completion of this course, students will	
1	Understand the concept of Dynamic memory management, data types, algorithms, Big O notation	PO1,PO6
2	Understand basic data structures such as arrays, linked lists, stacks and queues	PO2
3	Describe the hash function and concepts of collision and its resolution methods	PO2,PO4
4	Solve problem involving graphs, trees and heaps	PO6,PO8
5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data	PO7
<b>Text Book</b>		
1	1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Pearson Education 2014, 4th Edition.	
2	Reema Thareja, “Data Structures Using C”, Oxford Universities Press 2014, 2nd Edition	
<b>Reference Books</b>		
1.	Thomas H.Cormen,Chales E.Leiserson,Ronald L.Rivest, Clifford Stein, “Introduction to Algorithms”, McGraw Hill 2009, 3rd Edition.	
2.	Aho, Hopcroft and Ullman, “Data Structures and Algorithms”, Pearson Education 2003	
<b>Web Resources</b>		
1.	NPTEL & MOOC courses titled Data Structures	
2.	<a href="https://nptel.ac.in/courses/106106127/">https://nptel.ac.in/courses/106106127/</a>	

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	-	1	-
CO 2	1	2	1	-	-	-
CO 3	3	1	2	1	-	-
CO 4	2	2	1	-	-	1
CO 5	3	1	1	-	-	-
<b>Weightage of course contributed to each PSO</b>	12	9	8	1	1	1

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

Title of the Course/ Paper	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	M a r k s		
									CIA	External	Total

<b>U23CU6P</b>	<b>DATA STRUCTURES AND ALGORITHMS LAB using C++</b>	Core	-	-	Y	-	3	4	25	75	100
<b>NATURE OF THE COURSE</b>											
Relevant to Global need		Employability Oriented		Address Professional Ethics							
Relevant to National need		Entrepreneurship Oriented		Address Gender Sensitization							
Relevant to Regional need		Skill Development Oriented		Address Environment and Sustainability							
Relevant to Local need				Address Human values							
<b>Course Objective</b>											
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										
<b>Sl. No</b>	<b>Details</b>										<b>No. of Hours</b>
1.	Write a program to implement the List ADT using arrays and linked lists.										
2.	Write a programs to implement the following using a singly linked list. <ul style="list-style-type: none"> <li>• Stack ADT</li> <li>• Queue ADT</li> </ul>										
3.	Write a program that reads an infix expression, converts the expression to postfix form and then evaluates the postfix expression (use stack ADT).										
4.	Write a program to implement priority queue ADT.										
5.	Write a program to perform the following operations: <ul style="list-style-type: none"> <li>• Insert an element into a binary search tree.</li> <li>• Delete an element from a binary search tree.</li> <li>• Search for a key element in a binary search tree.</li> </ul>										
6.	Write a program to perform the following operations <ul style="list-style-type: none"> <li>• Insertion into an AVL-tree</li> </ul>										

	<ul style="list-style-type: none"> <li>• Deletion from an AVL-tree</li> </ul>	
7.	Write a programs for the implementation of BFS and DFS for a given graph.	
8	Write a programs for implementing the following searching methods: <ul style="list-style-type: none"> <li>• Linear search</li> <li>• Binary search.</li> </ul>	
9.	Write a programs for implementing the following sorting methods: <ul style="list-style-type: none"> <li>• Bubble sort</li> <li>• Selection sort</li> <li>• Insertion sort</li> <li>• Radix sort.</li> </ul>	
<b>Total</b>		
<b>Course Outcomes</b>		<b>Programmem Outcome</b>
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,PO8
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
<b>Text Book</b>		
1	Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Pearson Education 2014, 4th Edition.	
2	Reema Thareja, “Data Structures Using C”, Oxford Universities Press 2014, 2nd Edition	
<b>Reference Books</b>		
1	Thomas H.Cormen,Chales E.Leiserson,Ronald L.Rivest, Clifford Stein, “Introduction to Algorithms”, McGraw Hill 2009, 3rd Edition	
2.	Aho, Hopcroft and Ullman, “Data Structures and Algorithms”, Pearson Education 2003	
<b>Web Resources</b>		
1.	NPTEL & MOOC courses titled Data Structures	
2.	<a href="https://nptel.ac.in/courses/106106127/">https://nptel.ac.in/courses/106106127/</a>	

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	2	1	-
CO 2	1	2	1	-	-	2
CO 3	3	1	2	1	-	-
CO 4	2	2	1	2	3	1
CO 5	3	2	1	-	-	-
<b>Weightage of course contributed to each PSO</b>	12	10	8	5	4	4

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Mark s	External	Total
									CIA		
U23GU72	Database Management System	GEC	Y	-	-	-	4	5	25	75	100
<b>NATURE OF THE COURSE</b>											
Relevant to Global need		Employability Oriented		Address Professional Ethics							
Relevant to National need		Entrepreneurship Oriented		Address Gender Sensitization							
Relevant to Regional need		Skill Development Oriented		Address Environment and Sustainability							
Relevant to Local need				Address Human values							
<b>Course Objective</b>											
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	Details	No. of Hours	Course Objective
	<b>Database Concepts:</b> 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	CO1
II	<b>Design Concepts:</b> 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	CO2
III	<b>Normalization of Database Tables:</b> Database tables and Normalization – The Need for Normalization –The Normalization Process – Higher level Normal Form. <b>Introduction to SQL:</b> Data Definition Commands – Data Manipulation Commands – SELECT Queries – Additional Data Definition Commands – Additional SELECT Query Keywords – Joining Database Tables.	15	CO3
IV	<b>Advanced SQL:</b> Relational SET Operators: UNION – UNION ALL – INTERSECT - MINUS.SQL Join Operators: Cross Join – Natural Join – Join USING Clause – JOIN ON Clause – Outer Join. <b>Sub Queries and Correlated Queries:</b> WHERE – IN – HAVING – ANY and ALL – FROM. SQL Functions: Date and Time Function – Numeric Function – String Function – Conversion Function	15	CO4
V	<b>PL/SQL:</b> A Programming Language: History – Fundamentals – Block Structure – Comments – Data Types – Other Data Types – Variable Declaration – Assignment operation –Arithmetic operators. <b>Control Structures and Embedded SQL:</b> Control Structures – Nested Blocks – SQL in PL/SQL – Data Manipulation – Transaction Control statements. <b>PL/SQL Cursors and Exceptions:</b> 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	CO5
	<b>Total</b>	<b>75</b>	
<b>Course Outcomes</b>		<b>Programme Outcomes</b>	
CO	On completion of this course, students will		
1	Understand the various basic concepts of Data Base System. Difference between file system and DBMS and	PO1	

	compare various data models.	
2	Define the integrity constraints. Understand the basic concepts of Relational Data Model, Entity-Relationship Model.	PO1, PO2
3	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
4	Classify the different functions and various join operations and enhance the knowledge of handling multiple tables.	PO4, PO5, PO6
5	Learn to design Data base operations and implement using PL/SQL programs. Learn basics of PL/SQL and develop programs using Cursors, Exceptions	PO3, PO8
<b>Text Book</b>		
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	
<b>Reference Books</b>		
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	
<b>Web Resources</b>		
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
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
<b>Weightage of course contributed to each PSO</b>	15	15	14	15	14	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
U23GU74P	RDBMS Lab	GEC	Y	-	-	-	4	5	25	75	100

NATURE OF THE COURSE			
Relevant to Global need		Employability Oriented	Address Professional Ethics
Relevant to National need		Entrepreneurship Oriented	Address Gender Sensitization
Relevant to Regional need		Skill Development Oriented	Address Environment and Sustainability
Relevant to Local need			Address Human values

## List of Programs

### SYLLABUS

1. Working with DDL Commands
2. Working with DML Commands
3. Working with date and time handling functions
4. Working with Constraints – NotNull, Primary Key, Check, Unique, Foreign Key
5. Working with simple SQL commands
6. Working with GROUP..BY , HAVING queries
7. Working with Aggregate Queries – COUNT, MIN, MAX, SUM and AVG
8. Working with set operations – UNION, INTERSECTION and MINUS
9. Working with OUTER JOINS ( left outer, right outer and full outer)
10. Working with nested queries
11. Fibonacci series generation using PL/SQL
12. Factorial calculation using PL/SQL
13. Raising Build in Exceptions
14. Raising User defined exceptions
15. Creating and Calling functions
16. Creating and Calling Procedures
17. Creating triggers

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									External	Total	
U23SEU15	<b>Enterprise Resource Planning</b>	SEC	2	-	-	-	2	2	75	100	
<b>NATURE OF THE COURSE</b>											
Relevant to Global need		Employability Oriented		Address Professional Ethics							
Relevant to National need		Entrepreneurship Oriented		Address Gender Sensitization							
Relevant to Regional need		Skill Development Oriented		Address Environment and Sustainability							
Relevant to Local need				Address Human values							
<b>Course Objective</b>											
LO1	To understand the basic concepts, Evolution and Benefit of ERP.										
LO2	To know the need and Role of ERP in logical and Physical Integration.										
LO3	Identify the important business functions provided by typical business softwares such as enterprise resource planning and customer relationship management										
LO4	To train the students to develop the basic understanding of how ERP enriches the business organizations in achieving a multidimensional growth										
LO5	To aim at preparing the students technological competitive and make them ready to self-upgrade with the high technical skills										
<b>UNIT</b>	<b>Details</b>							<b>No. of Hours</b>			

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 Warehousing, 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, Consultants, Vendors and Employees.	6
V	ERP & E-Commerce, Future Directives in ERP, ERP and	6
	Internet, Critical success and failure factors, Integrating ERP into organizational culture. Using ERP tool: either SAP or ORACLE for a case study.	
	<b>Total</b>	<b>30</b>
<b>Course Outcomes</b>		
<b>Course Outcomes</b>	On completion of this course, students will;	
<b>CO1</b>	Understand the basic concepts of ERP.	PO1, PO2, PO6
<b>CO2</b>	Identify different technologies used in ERP	PO2, PO3, PO8
<b>CO3</b>	Understand and apply the concepts of ERP Manufacturing Perspective and ERP Modules	PO1, PO3, PO7
<b>CO4</b>	Discuss the benefits of ERP	PO2, PO6
<b>CO5</b>	Apply different tools used in ERP	PO1, PO3, PO8
<b>Reference Text:</b>		
1.	Enterprise Resource Planning – Alexis Leon, Tata McGraw Hill.	
<b>References:</b>		
1.	Enterprise Resource Planning – Diversified by Alexis Leon, TMH.	
2.	Enterprise Resource Planning – Ravi Shankar & S. Jaiswal, Galgotia	

WebResources	
1.	1. <a href="https://www.tutorialspoint.com/management_concepts/enterprise_resource_planning.htm">https://www.tutorialspoint.com/management_concepts/enterprise_resource_planning.htm</a>
2.	1. <a href="https://www.saponlinetutorials.com/what-is-erp-systems-enterprise-resource-planning/">https://www.saponlinetutorials.com/what-is-erp-systems-enterprise-resource-planning/</a>
3.	1. <a href="https://www.guru99.com/erp-full-form.html">https://www.guru99.com/erp-full-form.html</a>
4.	2. <a href="https://www.oracle.com/in/erp/what-is-erp/">https://www.oracle.com/in/erp/what-is-erp/</a>

**MappingwithProgrammeOutcomes:**

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	3	2	1	3	2
CO2	3	2	-	1	2	-
CO3	2	3	2	2	3	2
CO4	1	-	2	1	-	2
CO5	3	3	-	1	3	-
Weightageofcoursecontributedtoeach PSO	10	11	6	7	11	6

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
U23SEU3P	WEB DESIGNING Lab	SEC	Y	-	-	-	4	5	25	75	100

NATURE OF THE COURSE			
Relevant to Global need		Employability Oriented	Address Professional Ethics
Relevant to National need		Entrepreneurship Oriented	Address Gender Sensitization
Relevant to Regional need		Skill Development Oriented	Address Environment and

				Sustainability
Relevant to Local need				Address Human values

## List of Programs

1. Design the following static web pages required for an online book store web site.
  - 1) HOME PAGE: The static home page must contain three frames.
  - 2) LOGIN PAGE
  - 3) CATALOGUE PAGE: The catalogue page should contain the details of all the books available in the web site in a table.
  - 4) REGISTRATION PAGE
  
2. Write JavaScript to validate the following fields of the Registration page.
  1. First Name (Name should contains alphabets and the length should not be less than 6 characters).
  2. Password (Password should not be less than 6 characters length).
  3. E-mail id (should not contain any invalid and must follow the standard pattern name@domain.com)
  4. Mobile Number (Phone number should contain 10 digits only).
  5. Last Name and Address (should not be Empty).
  
3. Develop and demonstrate the usage of inline, internal and external style sheet using CSS
4. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next in the list. Add CSS to customize the properties of the font of the capital (color,bold and font size).
5. Write an HTML page including any required JavaScript that takes a number from text field in the range of 0 to 999 and shows it in words. It should not accept four and above digits, alphabets and special characters.
6. Create an XML document that contains 10 users information. Write a Java Program, which takes User Id as input and returns the user details by taking the user information from XML document using DOM parser or SAX parser.

**SEMESTER IV**

Subject Code	Subject Name	Category	L	T	P	S	Marks		
									Total

<b>U23CU7</b>	<b>Programming IN JAVA</b>	Core	Y	-	-	-	4	5	2 5	75	100
<b>Course Objectives</b>											
<b>Course Objective</b>											
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.										
<b>UNIT</b>	<b>Details</b>							<b>No. of Hours</b>	<b>Course Objectives</b>		
I	<b>Introduction:</b> ReviewofObject Orientedconcepts - HistoryofJava - Javabuzzwords - JVMarchitecture - Datatypes - Variables - Scope and life timeofvariables - arrays - operators - controlstatements - type conversion and casting - simple java program - constructors - methods - Static block - Static Data - StaticMethodStringand StringBufferClasses.							15	CO1		
II	<b>Inheritance:</b> 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. <b>Packages:</b> Definition-AccessProtection - ImportingPackages. <b>Interfaces:</b> Definition–Implementation–Extending Interfaces. <b>Exception Handling:</b> <i>try – catch - throw - throws – finally</i> – Built-inexceptions - Creating own Exception							15	CO2		

	classes.		
III	<p><b>Multithreaded Programming:</b> Thread Class - Runnable interface –Synchronization–Using synchronized methods– Using synchronized statement- InterthreadCommunication –Deadlock.</p> <p><b>I/O Streams:</b> Concepts of streams - Stream classes- Byte and Character stream - Reading console Input and Writing Console output - File Handling.</p>	15	CO3
IV	<p><b>AWT Controls:</b> 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.</p> <p><b>Event Handling:</b> Events - Event sources - Event Listeners - Event Delegation Model (EDM) - Handling Mouse and Keyboard Events - Adapter classes - Inner classes</p>	15	CO4
V	<p><b>Swing:</b> Introduction to Swing - Hierarchy of swing components. Containers - Top level containers - JFrame - JWindow - JDialog - JPanel - JButton - JToggleButton - JCheckBox - JRadioButton - JLabel, JtextField - JTextArea - JList - JComboBox - JScrollPane.</p>	15	CO5
	<b>Total</b>	<b>75</b>	
<b>Course Outcomes</b>			
<b>Course Outcomes</b>	On completion of this course, students will;		
<b>CO1</b>	Understand the basic Object-oriented concepts. Implement the basic constructs of Core Java.	PO1, PO2, PO6	
<b>CO2</b>	Implement inheritance, packages, interfaces and exception handling of Core Java.	PO2, PO3, PO8	
<b>CO3</b>	Implement multi-threading and I/O Streams of Core Java	PO1, PO3, PO7	
<b>CO4</b>	Implement AWT and Event handling.	PO2, PO6	
<b>CO5</b>	Use Swing to create GUI.	PO1, PO3, PO8	

<b>Text Books:</b>	
1.	Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010
2.	Gary Cornell, <i>Core Java 2 Volume I – Fundamentals</i> , Addison Wesley, 1999
<b>References :</b>	
1.	Head First Java, O’Rielly Publications,
2.	<b>Y. Daniel Liang, <i>Introduction to Java Programming</i>, 7th Edition, Pearson Education India, 2010</b>
<b>Web Resources</b>	
1.	<a href="https://javabeginnerstutorial.com/core-java-tutorial">https://javabeginnerstutorial.com/core-java-tutorial</a>
2.	<a href="http://docs.oracle.com/javase/tutorial/">http://docs.oracle.com/javase/tutorial/</a>
3.	<a href="https://www.coursera.org/">https://www.coursera.org/</a>

### Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	2	-	2	2	2
CO 2	3	1	2	1	2	2
CO 3	1	-	2	2	2	2
CO 4	2	2	2	2	2	2
CO 5	1	2	-	2	2	2
<b>Weightage of course contributed to each PSO</b>	10	7	6	9	10	10

**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
<b>U23CU8P</b>	<b>Programming in java lab</b>	Core	-	-	y	-	3	4	25	75	100
<b>Course Objective</b>											
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 know about Event Handling .										
LO4	To enable the students to use String Concepts.										
LO5	To equip the student with programming knowledge in to creat GUI using AWT controls.										
<b>UNIT</b>	<b>Details</b>										
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 CharacterArray 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										

	<b>c.</b> 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 <b>c.</b> 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. ArrayIndexOutOfBoundsException <b>d.</b> NegativeArraySizeException	
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	
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.	
<b>Total</b>		<b>60</b>
<b>Course Outcomes</b>		<b>Programme Outcome</b>
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, PO8
<b>Text Book</b>		
1	Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010.	
2.	Gary Cornell, <i>Core Java 2 Volume I – Fundamentals</i> , Addison Wesley, 1999.	
<b>Reference Books</b>		
1.	Head First Java, O’Rielly Publications,	
2.	Y. Daniel Liang, <i>Introduction to Java Programming</i> , 7th Edition, Pearson Education India, 2010.	
<b>Web Resources</b>		
1.	<a href="https://www.w3schools.com/java/">https://www.w3schools.com/java/</a>	
2.	<a href="http://java.sun.com">http://java.sun.com</a>	
3.	<a href="http://www.afu.com/javafaq.html">http://www.afu.com/javafaq.html</a>	

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	2	1	3	2	3
CO 2	3	2	1	3	1	3
CO 3	3	2	1	3	2	3
CO 4	3	2	1	3	2	3
CO 5	3	2	1	3	2	3
<b>Weightage of course contributed to each PSO</b>	15	10	5	15	9	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
<b>U23GU73</b>	<b>Artificial Intelligence</b>	GEC	-	Y	-	-	4	5	25	75	100
<b>Course Objective</b>											
LO1	To learn various concepts of AI Techniques.										
LO2	To learn various Search Algorithm in AI.										
LO3	To learn probabilistic reasoning and models in AI.										
LO4	To learn about Markov Decision Process.										
LO5	To learn various type of Reinforcement learning.										
UNIT	Details										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										15
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										15

III	Probabilistic Reasoning : Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference, temporal model, hidden Markov model.	15
IV	Markov Decision process : MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable MDPs.	15
V	Reinforcement Learning : Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning	15
<b>Total</b>		<b>75</b>
<b>Course Outcomes</b>		<b>Programme Outcome</b>
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, PO8
<b>Text Book</b>		
1	Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach” , 3rd Edition, Prentice Hall.	
	Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill	
<b>Reference Books</b>		
1.	Trivedi, M.C., “A Classical Approach to Artificial Intelligence”, Khanna Publishing House, Delhi.	
2.	Saroj Kaushik, “Artificial Intelligence”, Cengage Learning India, 2011	
3.	David Poole and Alan Mackworth, “Artificial Intelligence: Foundations for Computational Agents”, Cambridge University Press 2010	
<b>Web Resources</b>		
1.	NPTEL&MOOCcoursestitledArtificialIntelligenceandExpertSystems	
2.	<a href="https://nptel.ac.in/courses/106106140/">https://nptel.ac.in/courses/106106140/</a>	
3.	<a href="https://nptel.ac.in/courses/106106126/">https://nptel.ac.in/courses/106106126/</a>	

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	2	3	2	3	2	-
CO 2	2	-	2	3	3	2
CO 3	1	2	-	-	2	3
CO 4	3	1	2	2	2	1
CO 5	2	1	3	1	2	2
<b>Weightage of course contributed to each PSO</b>	10	7	9	9	11	8

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

Subject Code	Subject Name	Category	L	T	P	S			Marks		
											Total
<b>U23SEU20</b>	<b>Software Engineering</b>	SEC	Y	-	-	-	4	5	25	75	100
<b>Course Objectives</b>											
LO1	Gain basic knowledge of analysis and design of systems										
LO2	Ability to apply software engineering principles and techniques										
LO3	Model a reliable and cost-effective software system										
LO4	Ability to design an effective model of the system										
LO5	Perform Testing at various levels and produce an efficient system.										
UNIT	Details							No. of Hours	Course Objectives		
I	<p><b>Introduction:</b> The software engineering discipline, programs vs. software products, why study software engineering, emergence of software engineering, Notable changes in software development practices, computer systems engineering.</p> <p><b>Software Life Cycle Models:</b> Why use a life cycle</p>							12	CO1		

	model, Classical waterfall model, iterative waterfall model, prototyping model, evolutionary model, spiral model, comparison of different life cycle models.		
II	<p><b>Requirements Analysis and Specification:</b> Requirements gathering and analysis, Software requirements specification (SRS)</p> <p><b>Software Design:</b> Good software design, cohesion and coupling, neat arrangement, software design approaches, object- oriented vs function-oriented design</p>	12	CO2
III	<p><b>Function-Oriented Software Design:</b> Overview of SA/SD methodology, structured analysis, data flow diagrams (DFD's), structured design, detailed design.<b>User-Interface design:</b> Characteristics of a good interface; basic concepts; types of user interfaces; component based GUI development, a user interface methodology.</p>	12	CO3
IV	<p><b>Coding and Testing:</b> Coding; code review; testing; testing in the large vs testing in the small; unit testing; black-box testing; white-box testing; debugging; program analysis tools; integration testing; system testing; some general issues associated with testing.<b>Software Reliability and Quality Management:</b> Software reliability; statistical testing; software quality; software quality management system; SEI capability maturity model; personal software process.</p>	12	CO4
V	<p><b>Computer Aided Software Engineering:</b> CASE and its scope; CASE environment; CASE support in software life cycle; other characteristics of CASE tools; towards second generation CASE tool; architecture of a CASE environment. <b>Software Maintenance:</b> Characteristic of software maintenance; software reverse engineering;</p>	12	CO5

	software maintenance process models; estimation of maintenance cost;		
	<b>Total</b>	<b>60</b>	
<b>Course Outcomes</b>			
<b>Course Outcomes</b>	On completion of this course, students will;		
<b>CO1</b>	Gain basic knowledge of analysis and design of systems	PO1	
<b>CO2</b>	Ability to apply software engineering principles and techniques	PO1, PO2	
<b>CO3</b>	Model a reliable and cost-effective software system	PO4, PO6	
<b>CO4</b>	Ability to design an effective model of the system	PO4, PO5, PO6	
<b>CO5</b>	Perform Testing at various levels and produce an efficient system.	PO3, PO8	
<b>Text Books</b>			
1.	Rajib Mall, Fundamentals of Software Engineering, Fifth Edition, Prentice-Hall of India, 2018		
<b>References Books</b>			
1.	<b>Richard Fairley, Software Engineering Concepts, Tata McGraw-Hill publishing company Ltd, Edition 1997</b>		
2.	Roger S. Pressman, Software Engineering, Seventh Edition, McGraw-Hill.		
3.	James A. Senn, Analysis & Design of Information Systems, Second Edition, McGraw-Hill International Editions.		

**Mapping with Programme Outcomes:**

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

<b>CO 4</b>	<b>3</b>	<b>-</b>	<b>2</b>	<b>2</b>	<b>-</b>	<b>1</b>
<b>CO 5</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>1</b>
<b>Weightage of course contributed to each PSO</b>	11	6	12	9	4	5

**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
<b>U23SEU9</b>	<b>Image Processing</b>	SEC	-	Y	-	-	3	5	25	75	100
<b>Course Objective</b>											
LO1	To learn fundamentals of digital image processing.										
LO2	To learn about various 2D Image transformations										
LO3	To learn about various image enhancement processing methods and filters										
LO4	To learn about various classification of Image segmentation techniques										
LO5	To learn about various image compression techniques										
<b>UNIT</b>	<b>Details</b>										<b>No. of Hours</b>
I	<b>Digital Image Fundamentals:</b> Image representation - Basic relationship between pixels, Elements of DIP system -Applications of Digital Image Processing - 2D Systems - Classification of 2D Systems - Mathematical Morphology- Structuring Elements- Morphological Image Processing - 2D Convolution - 2D Convolution Through Graphical Method -2D Convolution Through Matrix Analysis										15
II	2D Image transforms: Properties of 2D-DFT - Walsh transform - Hadamard transform- Haar transform- Discrete Cosine Transform- Karhunen-Loeve Transform -Singular Value Decomposition										15
III	Image Enhancement: Spatial domain methods- Point processing- Intensity transformations - Histogram processing- Spatial filtering- smoothing filter- Sharpening filters - Frequency domain methods: low pass filtering, high pass Filtering- Homomorphic filter.										15
IV	Image segmentation: Classification of Image segmentation techniques - Region approach – Clustering techniques - Segmentation based on										15

	thresholding - Edge based segmentation - Classification of edges- Edge detection - Hough transform- Active contour.	
V	Image Compression: Need for compression -Redundancy- Classification of image- Compression schemes- Huffman coding- Arithmetic coding- Dictionary based compression -Transform based compression,	15
<b>Total</b>		<b>75</b>
<b>Course Outcomes</b>		<b>Programme Outcome</b>
CO	On completion of this course, students will	
1	Understand the fundamental concepts of digital image processing.	PO1
2	Understand various 2D Image transformations	PO1, PO2
3	Understand image enhancement processing techniques and filters	PO4, PO6
4	Understand the classification of Image segmentation techniques	PO4, PO5, PO6
5	Understand various image compression techniques	PO3, PO8
<b>Text Book</b>		
1	S Jayaraman, S Esakkirajan, T Veerakumar, Digital image processing ,Tata McGraw Hill, 2015	
2	Gonzalez Rafel C, Digital Image Processing, Pearson Education, 2009	
<b>Reference Books</b>		
1.	1. Jain Anil K , Fundamentals of digital image processing: , PHI,1988	
2.	Kenneth R Castleman , Digital image processing:, Pearson Education,2/e,2003	
3.	Pratt William K , Digital Image Processing: , John Wiley,4/e,2007	
<b>Web Resources</b>		
1.	<a href="https://kanchiuniv.ac.in/coursematerials/Digital%20image%20processing%20-Vijaya%20Raghavan.pdf">https://kanchiuniv.ac.in/coursematerials/Digital%20image%20processing%20-Vijaya%20Raghavan.pdf</a>	
2.	<a href="http://sdeuoc.ac.in/sites/default/files/sde_videos/Digital%20Image%20Processing%203rd%20ed.%20-%20R.%20Gonzalez%2C%20R.%20Woods-ilovepdf-compressed.pdf">http://sdeuoc.ac.in/sites/default/files/sde_videos/Digital%20Image%20Processing%203rd%20ed.%20-%20R.%20Gonzalez%2C%20R.%20Woods-ilovepdf-compressed.pdf</a>	
3.	<a href="https://dl.acm.org/doi/10.5555/559707">https://dl.acm.org/doi/10.5555/559707</a>	
4.	<a href="https://www.ijert.org/image-processing-using-web-2-0-2">https://www.ijert.org/image-processing-using-web-2-0-2</a>	

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	1	3	2	2	3	1
CO 2	3	2	3	2	3	3
CO 3	3	3	2	2	2	1
CO 4	3	3	3	1	3	3
CO 5	3	2	3	3	3	3
<b>Weightage of course contributed to each PSO</b>	13	13	13	10	14	11

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

### THIRD YEAR

### SEMESTER V

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
U23CU9	Operating Systems	Core	Y	-	-	-	5	5	25	75	100
<b>Course Objective</b>											
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	Course Objective			
	<b>Introduction:</b> operating system, history (1990s to 2000 and beyond), distributed computing, parallel computation. <b>Process concepts:</b> definition of process,						15	CO1			

	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.		
II	<p><b>Asynchronous concurrent processes:</b> 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.</p> <p><b>Concurrent programming:</b> monitors, message passing</p>	15	CO2
III	<p><b>Deadlock and indefinite postponement:</b> Resource concepts, four necessary conditions for deadlock, deadlock prevention, deadlock avoidance and Dijkstra's Banker's algorithm, deadlock detection, deadlock recovery.</p>	15	CO3
IV	<p><b>Job and processor scheduling:</b> 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.</p>	15	CO4
V	<p><b>Real Memory organization and Management.:</b> Memory organization, Memory management, Memory hierarchy, Memory management strategies, contiguous vs non-contiguous memory allocation, single user</p>	15	CO5

	contiguous memory allocation, fixed partition multiprogramming, variable partition multiprogramming, Memory swapping  <b>Virtual Memory organization:</b> virtual memory basic concepts, multilevel storage organization, block mapping, paging basic concepts, segmentation, paging/segmentation systems.  <b>Virtual Memory Management:</b> Demand Paging, Page replacement strategies		
	<b>Total</b>	<b>75</b>	
<b>Course Outcomes</b>		<b>Programme Outcomes</b>	
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	
<b>Text Book</b>			
1	H.M. Deitel, Operating Systems, Third Edition, Pearson Education Asia, 2011		
<b>Reference Books</b>			
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, Ninth Edition, John Wiley & Sons(ASIA) Pte Ltd., 2012		
<b>Web Resources</b>			

1.	
2.	

**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
<b>Weightage of course contributed to each PSO</b>	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	Marks		
									CIA	External	Total
<b>U23CU10</b>	<b>ASP .Net Programming</b>	Core	Y	-	-	-	5	5	25	75	100
<b>Course Objective</b>											
LO1	To identify and understand the goals and objectives of the .NET framework and ASP.NET with C# language.										
LO2	To develop ASP.NET Web application using standardcontrols.										
LO3	To implement file handling operations.										
LO4	To handles SQL Server Database using ADO.NET.										
LO5	Understand the Grid view control and XML classes.										
<b>UNIT</b>	<b>Details</b>							<b>No. of Hours</b>	<b>Course Objective</b>		

I	Overview of .NET framework: Common Language Runtime (CLR), Framework Class Library- C# Fundamentals: Primitive types and Variables – Operators - Conditional statements -Looping statements – Creating and using Objects – Arrays – Stringoperations.	15	C1
II	Introduction to ASP.NET - IDE-Languages supported Components -Working with Web Forms – Web form standard controls: Properties and its events – HTML controls -List Controls: Properties and its events.	15	C2
III	Rich Controls: Properties and its events – validation controls: Properties and its events– File Stream classes - File Modes – File Share – Reading and Writing to files – Creating, Moving, Copying and Deletingfiles – File uploading.	15	C3
IV	ADO.NET Overview – Database Connections – Commands – Data Reader - Data Adapter - Data Sets - Data Controlsand its Properties – DataBinding	15	C4
V	Grid View control: Deleting, editing, Sorting and Paging. XML classes – Web form to manipulate XML files - Website Security - Authentication - Authorization – Creating aWeb application.	15	C5
<b>Total</b>		<b>60</b>	
<b>Course Outcomes</b>		<b>Programme Outcome</b>	
CO	On completion of this course, students will		
1	Develop working knowledge of C# programming constructs and the .NET Framework	PO1, PO2, PO6	
2	To develop a software to solve real-world problems using ASP.NET	PO2, PO3, PO8	
3	To Work On Various Controls Files	PO1, PO3, PO7	
4	To create a web application using MicrosoftADO.NET.	PO2, PO6	
5	To develop web applications using XML	PO1, PO3, PO8	
<b>Text Book</b>			

1	SvetlinNakov,VeselinKolev& Co, Fundamentals of Computer Programming with C#,Faber publication,2019.
2	Mathew, Mac Donald, The Complete Reference ASP.NET, Tata McGraw-Hill,2015.
<b>Reference Books</b>	
1.	Herbert Schildt, The Complete Reference C#.NET, TataMcGraw-Hill,2017.
2.	Kogent Learning Solutions, C# 2012 Programming Covers .NET 4.5 Black Book, Dreamtech pres,2013.
3.	Anne Boehm, Joel Murach, Murach's C# 2015, Mike Murach& Associates Inc.2016.
4.	DenielleOtey, Michael Otey, ADO.NET: The Complete reference, McGrawHill,2008.
5.	Matthew MacDonald, Beginning ASP.NET 4 in C# 2010,APRESS,2010.
<b>Web Resources</b>	
1.	<a href="https://www.geeksforgeeks.org/introduction-to-net-framework/">https://www.geeksforgeeks.org/introduction-to-net-framework/</a>
2.	<a href="https://www.javatpoint.com/net-framework">https://www.javatpoint.com/net-framework</a>

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	1	2	2	1	3
CO 2	3	2	2	2	2	3
CO 3	3	3	2	2	3	3
CO 4	3	1	2	2	1	3
CO 5	3	1	2	2	1	2
<b>Weightage of course contributed to each PSO</b>	15	8	10	10	8	14

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

Subject	Subject Name	☺	☹	↔	L	T	P	S			Marks
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Code		Category					Credits	Inst.	Hours CIA	External	Total
U23CU11P	<b>ASP.Net Programming LAB</b>	Core	-	-	Y	-	3	4	25	75	100
<b>Course Objective</b>											
LO1	To develop ASP.NET Web application using standard controls.										
LO2	To create rich database applications using ADO.NET.										
LO3	To implement file handling operations.										
LO4	To implement XML classes.										
LO5	To utilize ASP.NET security features for authenticating the website										
Sl. No	Programs										Course Objective
1.	Create an exposure of Web applications and tools										C1
2.	Implement the Html Controls										
3.	Implement the Server Controls										
4.	Web application using Web controls.										
5.	Web application using List controls.										
6.	Web Page design using Rich control. Validate user input using Validation controls. Working with File concepts.										C2
1.	Web application using Data Controls.										
2.	Data binding with Web controls										
3.	Data binding with Data Controls.										C3
4.	Database application to perform insert, update and delete operations.										
5.	Database application using Data Controls to perform insert, delete, edit, paging and sorting operation.										
6.	Implement the Xml classes.										C4
7.	Implement Authentication – Authorization.										
8.	Ticket reservation using ASP.NET controls.										

			C5
9.	Online examination using ASP.NET controls		
<b>Total</b>			
<b>Course Outcomes</b>		<b>Programme Outcome</b>	
CO	On completion of this course, students will		
1	To create web applications and implement various controls	PO1, PO2, PO6	
2	Create a web pages in Rich control.	PO3, PO8	
3	Develop knowledge about file handling operations	PO1, PO4, PO8	
4	An ability to design XML classes	PO2, PO6, PO7	
5	To develop a software to solve real-world problems using ASP.NET	PO1,PO3, PO5, PO8	
<b>Text Book</b>			
1	SvetlinNakov, VeselinKolev & Co, Fundamentals of Computer Programming with C#,Faber publication,2019.		
2	Mathew, Mac Donald, The Complete Reference ASP.NET, Tata McGraw-Hill,2015.		
<b>Reference Books</b>			
1.	Herbert Schildt, The Complete Reference C#.NET, TataMcGraw-Hill,2017.		
2.	Kogent Learning Solutions, C# 2012 Programming Covers .NET 4.5 Black Book, Dreamtech pres,2013.		
3.	Anne Boehm, Joel Murach, Murach's C# 2015, Mike Murach & Associates Inc.2016.		
4.	DenielleOtey, Michael Otey, ADO.NET: The Complete reference, McGrawHill,2008.		
5.	Matthew MacDonald, Beginning ASP.NET 4 in C# 2010,APRESS,2010.		
<b>Web Resources</b>			
1.	<a href="https://www.geeksforgeeks.org/introduction-to-net-framework/">https://www.geeksforgeeks.org/introduction-to-net-framework/</a>		
2.	<a href="https://www.javatpoint.com/net-framework">https://www.javatpoint.com/net-framework</a>		

**Mapping with Programme Outcomes:**

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

<b>CO 5</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b>
<b>Weightage of course contributed to each PSO</b>	<b>15</b>	11	12	10	6	7

**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
<b>U23DU08</b>	<b>Open Source Software Technologies</b>	DSEC	C	-	-	-	3	2	25	75	100
<b>Course Objective</b>											
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.										
<b>UNIT</b>	<b>Details</b>								<b>No. of Hours</b>	<b>C</b>	<b>O</b>
I	Open Source – open source vs. commercial software – What is Linux – Free Software – Where I can use Linux - Linux kernel – Linux distributions.								6		C1
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 StreamEditor								6		C2
III	Introduction - Apache Explained – Starting, Stopping and Restarting Apache –Modifying the Default configuration – Securing Apache – Set user and Group								6		C3
IV	<b>UNIT IV: MySQL:</b> Introduction to MySQL – The show databases and table – The USE command –Create Database and Tables – Describe Table – Select, Insert, Update and Delete statementdatabase.								6		C4

V	<ul style="list-style-type: none"> <li><b>Introduction</b> –PHP Form processing – Database Access with PHP – MySQL, MySQL Functions – Inserting Records – Selecting Records – Deleting Records – Update Records.</li> </ul>	6	C6
<b>Total</b>		<b>30</b>	
<b>Course Outcomes</b>		<b>Programmeme Outcomea</b>	
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	
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	
<b>Text Book</b>			
1	1. James Lee and Brent Ware “Open Source Web Development with LAMP using		
2	2. LINUX, Apache, MySQL, Perl and PHP”, Dorling Kindersley (India) Pvt. Ltd, 2008.		
<b>Reference Books</b>			
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.	5. Naramore Eligabette, Gerner Jason, Wrox Press, Wiley Dreamtech Press, “Beginning PHP5,		

	Apache, MySQL Web Development”, 2005.
<b>Web Resources</b>	
1.	<a href="#">Introduction to Open-Source and its benefits - GeeksforGeeks</a>
2.	<a href="https://www.bing.com/">https://www.bing.com/</a>

**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
<b>Weightage of course contributed to each PSO</b>	12	9	13	10	12	8

S-Strong-3    M-Medium-2    L-Low-1

Subject Code	Subject Name	Category	L	T	P	S			Marks		
											Total
U23DU19	Data Mining And	DSEC	Y	-	-	-	3	2	25	75	100

	<b>Warehousing</b>											
<b>Course Objectives</b>												
LO1	To provide the knowledge on Data Mining and Warehousing concepts and techniques											
LO2	To study the basic concepts of Data Mining, Architecture and Comparison.											
LO3	To study a set of Mining Association Rules, Data Warehouses.											
LO4	To study about Classification and Prediction, Classifier Accuracy											
LO5	To study the basic concepts of cluster analysis, Cluster Methods											
<b>UNIT</b>	<b>Details</b>										<b>No. of Hours</b>	<b>Course Objectives</b>
I	Data Warehousing: Introduction – What is data warehouse? – Definition – Multidimensional data model – OLAP operation – Warehouse schema – Data Warehousing Architecture – Warehouse server – Meta data – OLAP engine – Data warehouse backend process.										15	CO1
II	Data mining: introduction – what is data mining – data mining definitions – KDD Vs Data mining - DBMSVs Data mining – Other related areas – DM techniques – Issues and challenges in data mining.										15	CO2
III	Association rules: introduction – what is an Associative Rule? – Method to discover Association Rules – Apriori Algorithm – Dynamic item set counting algorithm – FP growth algorithm. Clustering Techniques: Introduction – clustering paradigms – partitioning algorithms – K medoid algorithm – Hierarchical Clustering – DBSCAN – CURE.										15	CO3
IV	Classification Based Concept: Basic Concepts – Decision tree induction - Bayes Classification methods: Bayes Theorem – Naïve Bayesian Classification.										15	CO4

V	Web mining: Introduction, Web mining, Web content mining, Web structure mining, Web usage mining, Text mining. Temporal and Spatial data mining: Introduction, what is temporal Data mining, spatial mining, Spatial Mining Tasks.	15	CO5
<b>Total</b>		<b>75</b>	
<b>Course Outcomes</b>			
<b>Course Outcomes</b>	On completion of this course, students will;		
<b>CO1</b>	To understand the basic concepts and the functionality of the various data mining and data warehousing component	PO1, PO3, PO6, PO8	
<b>CO2</b>	To know the concepts of Data mining system architectures	PO1,PO2,PO3,PO6	
<b>CO3</b>	To analyze the principles of association rules	PO3, PO5	
<b>CO4</b>	To get analytical idea on Classification and prediction methods	PO1, PO2, PO3, PO7	
<b>CO5</b>	To Gain knowledge on Cluster analysis and its methods.	PO2, PO6, PO7	
<b>Text Books</b>			
<b>(Latest Editions)</b>			
1.Data Mining Techniques, Arun K. Pujari, University Press. (For Unit I, II, III and V)			
2. Data Mining concepts and techniques, Jawei Han, Micheline Kamber, Jian Pei, Margan Kaufmann Publishers – imprint of Elsevier, 3 <sup>rd</sup> Edition. – (For Unit IV only)			
<b>References Books</b>			
<b>(Latest editions)</b>			
	<ol style="list-style-type: none"> <li>Advances in Knowledge Discovery and Data Mining Usama M. Farrad, GeogoryPiatetsky – Shapiro, padhrai Smyth and RamasamyUthurusamy, The M.I.T.press.</li> <li>The Data Warehouse Life Cycle Toolhit, Ralph Kimball, John Wiley &amp; SonsInc.</li> <li>Data warehousing in Action, Sean Kelly, John Wiley &amp; SonsInc.</li> </ol>		

	4. Insights into data Mining, Theory and Practice, K.P Soman, ShyamDiwakar, V. Ajay PHI Publications Eastern Economy Edition 6th Printing,2012
<b>Web Resources</b>	
1.	<a href="https://www.topcoder.com/thrive/articles/data-warehousing-and-data-mining#:~:text=Data%20warehousing%20is%20a%20method,compiled%20in%20the%20data%20warehouse.">https://www.topcoder.com/thrive/articles/data-warehousing-and-data-mining#:~:text=Data%20warehousing%20is%20a%20method,compiled%20in%20the%20data%20warehouse.</a>
2.	<a href="https://www.javatpoint.com/data-mining-cluster-vs-data-warehousing">https://www.javatpoint.com/data-mining-cluster-vs-data-warehousing</a>
3.	<a href="https://www.tutorialspoint.com/Data-Warehousing-and-Data-Mining">https://www.tutorialspoint.com/Data-Warehousing-and-Data-Mining</a>

**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	2	2
CO 3	2	2	-	3	-	3
CO 4	3	3	2	3	1	1
CO 5	1	3	3	3	3	2
<b>Weightage of course contributed to each PSO</b>	<b>12</b>	<b>14</b>	<b>10</b>	<b>15</b>	<b>9</b>	<b>11</b>

S-Strong-3    M-Medium-2    L-Low-1

**SEMESTER VI**

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
U23CU13	Computer Networks	CORE	-	Y	-	-	5	5	25	75	100

<b>Course Objective</b>		
LO1	To understand the concept of Data communication and Computer network	
LO2	To get a knowledge on routing algorithms.	
LO3	To impart knowledge about networking and inter networking devices	
LO4	To study about Network communication.	
LO5	To learn the concept of Transport layer	
<b>UNIT</b>	<b>Details</b>	<b>No. of Hours</b>
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 Control Algorithms – IP Protocol – IP Addresses – Internet Control Protocols.	15
V	Transport Layer - Services - Connection Management - Addressing, Establishing and Releasing a Connection – Simple Transport Protocol – Internet Transport Protocols (ITP) - Network Security: Cryptography.	15
	<b>Total</b>	<b>75</b>
<b>Course Outcomes</b>		<b>Programme Outcome</b>
CO	On completion of this course, students will	
1	To Understand the basics of Computer Network architecture, OSI and TCP/IP reference model	PO1
2	To gain knowledge on Telephone systems using wireless network	PO1, PO2
3	To understand the concept of MAC	PO4, PO6
4	To analyze the characteristics of Routing and Congestion control algorithms	PO4, PO5, PO6
5	To understand network security and define various	PO3, PO8

	protocols such as FTP, HTTP, Telnet, DNS
<b>Text Book</b>	
1	A. S. Tanenbaum, “Computer Networks”, 4th Edition, Prentice-Hall of India, 2008.
<b>Reference Books</b>	
1.	B. A. Forouzan, “Data Communications and Networking”, Tata McGraw Hill, 4th Edition, 2017
2.	<b>F. Halsall, “Data Communications, Computer Networks and Open Systems”, Pearson Education, 2008</b>
3.	D. Bertsekas and R. Gallager, “Data Networks”, 2nd Edition, PHI, 2008.
4.	Lamarca, “Communication Networks”, Tata McGraw- Hill, 2002
<b>Web Resources</b>	
1.	<a href="https://en.wikipedia.org/wiki/Computer_network">https://en.wikipedia.org/wiki/Computer_network</a>
2.	<a href="https://citationsy.com/styles/computer-networks">https://citationsy.com/styles/computer-networks</a>

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	2	-	2	1	-
CO 2	3	2	1	2	2	-
CO 3	3	-	-	2	-	2
CO 4	3	1	-	2	1	-
CO 5	3	3	-	2	1	-
<b>Weightage of course contributed to each PSO</b>	15	8	1	10	5	2

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

Subject	Subject Name	U	A	L	T	P	S			Marks
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Code		Category					Credits	Inst. Hours	CIA	External	Total
<b>U23CU14</b>	<b>DATA ANALYTICS USING R Programming</b>	Core	Y	-	-	-	5	6	25	75	100
<b>Course Objective</b>											
LO1	To understand the problem solving approaches										
LO2	To learn the basic programming constructs in R Programming										
LO3	To learn the basic programming constructs in R Programming										
LO4	To use R Programming data structures - lists, tuples, and dictionaries.										
LO5	To do input/output with files in R Programming.										
UNIT	Details						No. of Hours	Course Objective			
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						18	C1			
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						18	C2			

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	18	C3
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 .	18	C4
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	18	C5
<b>Total</b>		<b>90</b>	
<b>Course Outcomes</b>		<b>Programme Outcomes</b>	
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, PO8	

<b>Text Book</b>	
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
<b>Reference Books</b>	
1.	1. Garrett Grolemond, Hadley Wickham, "Hands-On Programming with R: Write Your Own Functions and Simulations", 1st Edition, 2014
2.	Venables, W.N., and Ripley, "S programming", Springer, 2000.
<b>Web Resources</b>	
1.	<a href="https://www.simplilearn.com">https://www.simplilearn.com</a>

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	2	-	3	1	-
CO 2	3	3	2	2	-	2
CO 3	1	2	3	1	2	1
CO 4	2	2	1	-	2	1
CO 5	2	2	2	1	3	1
<b>Weightage of course contributed to each PSO</b>	11	11	8	7	8	5

S-Strong-3    M-Medium-2    L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	M a r k s		
									CIA	External	Total
U23CU15P	R Programming - LAB	Core	-	-	Y	-	3	5	25	75	100

<b>Course Objective</b>	
LO1	To understand the problem solving approaches
LO2	To learn the basic programming constructs in R Programming
LO3	To practice various computing strategies for R Programming -based solutions to real world problems
LO4	To use R Programming data structures - lists, tuples, and dictionaries.
LO5	To do input/output with files in R Programming.
<b>Sl. No</b>	<b>Details</b>
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.
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	<b>Write a R program to count the number of even and odd numbers from array of N numbers.</b>	
<b>Total</b>		
<b>Course Outcomes</b>		<b>Programme Outcome</b>
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,PO8
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
<b>Text Book</b>		
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	
<b>Reference Books</b>		
1	Garrett Golemud, Hadley Wickham, "Hands-On Programming with R: Write Your Own Functions and Simulations", 1st Edition, 2014	
2.	Venables, W.N., and Ripley, "S programming", Springer, 2000.	
<b>Web Resources</b>		
1.	<a href="https://www.simplilearn.com">https://www.simplilearn.com</a>	

**Mapping with Programme Outcomes:**

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

<b>Weightage of course contributed to each PSO</b>	11	15	15	15	5	10
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**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
<b>U23DU18P</b>	<b>PHP PROGRAMMING</b>	DSE C	Y				2	2	25	75	100
<b>Course Objective</b>											
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	Details								No. of Hours	Course Objectives	
I	Introduction to PHP -Basic Knowledge of websites - Introduction of Dynamic Website -Introduction to PHP - Scope of PHP -XAMPP and WAMP Installation								6	CO1	
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	CO2	
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	CO3	
IV	PHP Advanced Concepts -Reading and Writing Files - Reading Data from a File.								6	CO4	
V	Managing Sessions and Using Session Variables -Destroying a Session -Storing Data in Cookies -Setting Cookies.								6	CO5	
<b>Total</b>									<b>30</b>		
<b>Course Outcomes</b>						<b>Programme Outcomes</b>					
CO	On completion of this course, students will										

1	Write PHP scripts to handle HTML forms	PO1,PO4,PO6,PO8.
2	Write regular expressions including modifiers, operators, and metacharacters.	PO2,PO5,PO7.
3	Create PHP Program using the concept of array.	PO3,PO6,PO8.
4	Create PHP programs that use various PHP library functions	PO2,PO3,PO5,PO8.
5	Manipulate files and directories.	PO3,PO5,PO6.
<b>Text Book</b>		
1	<b>Head First PHP &amp; MySQL: A Brain-Friendly Guide- 2009-Lynn mighley and Michael Morrison.</b>	
2	<b>The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL- Alan Forbes</b>	
<b>Reference Books</b>		
1.	PHP: The Complete Reference-Sтивен Holzner.	
2.	DT Editorial Services (Author), “ <i>HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)</i> ”, Paperback 2016, 2 <sup>nd</sup> Edition.	
<b>Web Resources</b>		
1.	Refer MOOC Courses like NPTEL and SWAYAM	
2.	<a href="https://www.w3schools.com/php/default.asp">https://www.w3schools.com/php/default.asp</a>	

**Mapping with Programme Outcomes:**

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

**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
<b>U23DU15</b>	<b>Cloud Computing</b>	Elective	-	Y	-	-	3	4	25	75	100
<b>Course Objective</b>											
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.										
<b>UNIT</b>	<b>Details</b>									<b>No. of Hours</b>	
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.									15	

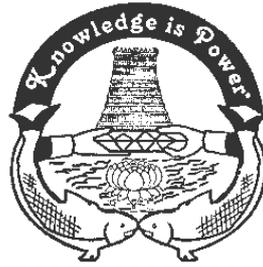
II	<p>Cloud Services</p> <p>Compute Services: Amazon Elastic Computer Cloud - Google Compute Engine - Windows Azure Virtual Machines</p> <p>Storage Services: Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage</p> <p>Database Services: Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database - Windows Azure Table Service</p> <p>Application Services: Application Runtimes and Frameworks - Queuing Services - Email Services - Notification Services - Media Services</p> <p>Content Delivery Services: Amazon CloudFront - Windows Azure Content Delivery Network</p> <p>Analytics Services: Amazon Elastic MapReduce - Google MapReduce Service - Google BigQuery - Windows Azure HDInsight</p> <p>Deployment and Management Services: Amazon Elastic Beanstack - Amazon CloudFormation</p> <p>Identity and Access Management Services: Amazon Identity and Access Management - Windows Azure Active Directory</p> <p>Open Source Private Cloud Software: CloudStack – Eucalyptus - OpenStack</p>	15
III	<p><b>Cloud Application Design:</b> 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: Relational Approach (SQL), Non-Relational Approach (NoSQL).</p>	15
IV	<p><b>Cloud Application Benchmarking and Tuning:</b> Introduction to Benchmarking – Steps in Benchmarking – Workload Characteristics – Application Performance Metrics – Design Consideration for Benchmarking Methodology – Benchmarking Tools and Types of Tests – Deployment Prototyping.</p> <p><b>Cloud Security:</b> Introduction – CSA Cloud Security Architecture – Authentication (SSO) – Authorization – Identity and Access Management – Data Security : Securing data at rest, securing data in motion – Key Management – Auditing.</p>	15
V	<p><b>Case Studies:</b> Cloud Computing for Healthcare – Cloud Computing for Energy Systems - Cloud Computing for Transportation Systems - Cloud Computing for Manufacturing Industry - Cloud Computing for</p>	15

	Education.	
	<b>Total</b>	<b>75</b>
	<b>Course Outcomes</b>	<b>Programme Outcome</b>
CO	On completion of this course, students will	
1	Understand the fundamental concepts and Technologies in Cloud Computing.	PO1
2	Able to understand various cloud service types and their uses and pitfalls.	PO1, PO2
3	Able to understand Cloud Architecture and Application design.	PO4, PO6
4	Understand the various aspects of application design, benchmarking and security in the Cloud.	PO4, PO5, PO6
5	Understand various Case Studies in Cloud Computing.	PO3, PO8
	<b>Text Book</b>	
1	ArshdeepBahga, Vijay Madiseti, <i>Cloud Computing – A Hands On Approach</i> , Universities Press (India) Pvt. Ltd., 2018	
	<b>Reference Books</b>	
1.	Anthony T Velte, Toby J Velte, Robert Elsenpeter, <i>Cloud Computing: A Practical Approach</i> , Tata McGraw-Hill, 2013.	
2.	Barrie Sosinsky, <i>Cloud Computing Bible</i> , Wiley India Pvt. Ltd., 2013.	
3.	David Crookes, <i>Cloud Computing in Easy Steps</i> , Tata McGraw Hill, 2015.	
4.	Dr. Kumar Saurabh, <i>Cloud Computing</i> , Wiley India, Second Edition 2012.	
	<b>Web Resources</b>	
1.	<a href="https://en.wikipedia.org/wiki/Cloud_computing">https://en.wikipedia.org/wiki/Cloud_computing</a>	
2.	<a href="https://link.springer.com/chapter/10.1007/978-3-030-34957-8_7">https://link.springer.com/chapter/10.1007/978-3-030-34957-8_7</a>	
3.	<a href="https://webobjects.cdw.com/webobjects/media/pdf/solutions/cloud-computing/121838-CDW-Cloud-Computing-Reference-Guide.pdf">https://webobjects.cdw.com/webobjects/media/pdf/solutions/cloud-computing/121838-CDW-Cloud-Computing-Reference-Guide.pdf</a>	

**Mapping with Programme Outcomes:**

<b>CO/PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO 1</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>1</b>
<b>CO 2</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>-</b>
<b>CO 3</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>3</b>
<b>CO 4</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>-</b>
<b>CO 5</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>Weightage of course contributed to each PSO</b>	13	10	8	14	12	7

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



SRI MEENAKSHI GOVT. ARTS COLLEGE FOR  
WOMEN

(AUTONOMOUS)

MADURAI – 625 002.

DEPARTMENT OF COMPUTER APPLICATIONS

BACHELOR OF COMPUTER APPLICATIONS

SYLLABUS TO BE INTRODUCED FOR THE ACADEMIC year

2023-24

**2024 – 2025 Batch**

### Annexure I

#### Suggested topics in Core component

11. Microprocessor and Microcontroller
12. Microprocessor and Microcontroller Lab
13. RDBMS with PL/SQL
14. PL/SQL Lab
15. Machine Learning
16. Machine Learning Lab
17. Network Security
18. Mobile Application Development
19. Mobile Application Development Lab
20. Introduction to Data Science and more.

#### Suggested topics in Elective Course

#### Generic Specific Elective Course - BCA

S.No	Sub code	Name of the Generic Elective Course	Opted
1.	U23GU58	Discrete Mathematics – I	GEC1
2.	U23GU59	Discrete Mathematics – II	
3	U23GU60	Statistical Methods and its Application-I	
4.	U23GU61	Statistical Methods and its Application-II	
5.	U23GU62	Optimization Techniques	
6.	U23GU63	Nano Technology	
7.	U23GU64	Introduction to Linear Algebra	
8.	U23GU65	Graph Theory and its Application	
9.	U23GU66	Financial Accounting	
10.	U23GU67	Cost and Management Accounting	
11.	U23GU68	Digital Logic Fundamentals	GEC 3

12.	<b>U23GU69</b>	Numerical Methods	
13.	<b>U23GU70</b>	Resource Management Techniques	
14.	<b>U23GU71P</b>	Multimedia Lab	GEC 2
15.	<b>U23GU72</b>	Database Management System	GEC 4
16.	<b>U23GU73</b>	Artificial Intelligence	GEC 6
17.,	<b>U23GU74P</b>	RDBMS Lab	GEC 5

### Skill Enhancement Course

S.No	Sub code	Name of the Skill Enhancement Elective Course	Opted
1.	<b>U23SEU1</b>	Fundamentals of Information Technology	
2.	<b>U23SEU2</b>	Introduction to HTML	
3	<b>U23SEU3p</b>	Web Designing lab	SEC 5
4.	<b>U23SEU4</b>	Software Testing	
5.	<b>U23SEU5</b>	Problem Solving Techniques	
6.	<b>U23SEU6</b>	Understanding Internet	
7.	<b>U23SEU7</b>	Office Automation	SEC 1
8.	<b>U23SEU8</b>	Quantitative Aptitude	
9.	<b>U23SEU9</b>	Image processing	SEC 3
10.	<b>U23SEU10</b>	Multimedia Systems	SEC 2
11.	<b>U23SEU11</b>	Advanced Excel	
12.	<b>U23SEU12</b>	Biometrics	
13.	<b>U23SEU13</b>	Cyber Forensics	
14.	<b>U23SEU14</b>	Pattern Recognition	
15.	<b>U23SEU15</b>	Enterprise Resource Planning	SEC 7
16.	<b>U23SEU16</b>	Robotics and Applications	
17.,	<b>U23SEU17</b>	Simulation and Modelling	
18.	<b>U23SEU18</b>	Organization Behavior	

19.	<b>U23SEU19</b>	Web design	SEC 4
20.	<b>U23SEU20</b>	Software Engineering	SEC 6

### Elective course – -Discipline Specific

S.NO	SUB CODE	COURSE	Opted
1	U23DU01	Software Metrics	
2	U23DU02	Natural Language Processing	
3	U23DU03	Analytics for Service Industry	
4	U23DU04	Cryptography	
5	U23DU05	Big Data Analytics	
6	U23DU06	IOT and its Applications	
7	U23DU07	Software Project Management	
8	U23DU08	Open Source Technologies	DSEC 1
9	U23DU09	Information Security	
10	U23DU10	Human Computer Interaction	
11	U23DU11	Fuzzy Logic	
12	U23DU12	Mobile Adhoc Network	
13	U23DU13	Computational Intelligence	
14	U23DU14	Grid Computing	
15	U23DU15	Cloud Computing	DSEC 3
16	U23DU16	Artificial Neural Network	
17	U23DU17	Agile Project Management and more..	
18	U23DU18	PHP Programming	DSEC 4
19	U23DU19	Data Mining and Warehousing	DSEC 2

**Suggested topics in Core component**

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	<b>Microprocessor and Microcontroller</b>		C	-	-	-	4	5	25	75	100
<b>Course Objective</b>											
LO1	To introduce the internal organization of Intel 8085 Microprocessor.										
LO2	To know about various instruction sets and classifications										
LO3	To enable the students to write assembly language programs using 8085.										
LO4	To interface the peripheral devices to 8085 using Interrupt controller and DMA interface.										
LO5	To provide real-life applications using microcontroller.										
UNIT	Details									No. of Hours	C O
I	Digital Computers - Microcomputer Organization-Computer languages –Microprocessor Architecture and its operations – Microprocessor initiated operations and 8085 Bus organization – Internal Data operations and 8085 registers - Peripheral or External initiated operations.									15	C1
II	8085 Microprocessor – Pinout and Signals – Functional block diagram - 8085 Instruction Set and Classifications.									15	C2
III	BCD to Binary and Binary to BCD conversions - ASCII to BCD and BCD to ASCII conversions - Binary to ASCII and ASCII to Binary conversions. BCD Arithmetic - BCD addition and Subtraction - Multibyte Addition and Subtraction - Multiplication and Division.									15	C3
IV	The 8085 Interrupts – RIM AND SIM instructions-8259 Programmable									15	C4

	Interrupt Controller-Direct Memory Access (DMA) and 8257 DMA controller.		
V	Introduction to Microcontroller - Microcontroller Vs Microprocessor - 8051 Microcontroller architecture - 8051 pin description. Timers and Counters – Operating Modes- Control Registers. Interrupts – Interrupts in 8051 - Interrupts Control Register – Execution of interrupt.	15	C6
<b>Total</b>		<b>60</b>	
<b>Course Outcomes</b>		<b>Programme Outcomea</b>	
CO	On completion of this course, students will		
1	Remember the Basic binary codes and their conversions. Binary concepts are used in Microprocessor programming and provide a good understanding of the architecture of 8085o introduce the internal organization of Intel 8085 Microprocessor..	Po1	
2	Understanding the 8085 instruction set and their classifications, enables the students to write the programs easily on their own using different logic	Po1,Po2	
3	Applying different types of instructions to convert binary codes and analyzing the outcome. The instruction set is applied to develop programs on multibyte arithmetic operations.	Po4,Po6	
4	Analyze how peripheral devices are connected to 8085 using Interrupts and DMA controller.	Po4,Po5,Po6	
5	An exposure to create real time applications using microcontroller.	Po3,Po8	
<b>Text Book</b>			
1	R. S. Gaonkar- "Microprocessor Architecture- Programming and Applications with 8085"- 5th Edition- Penram International Publications,2009. [For unit I to unit IV]		
2	Soumitra Kumar Mandal -“Microprocessors and Microcontrollers – Architectures, Programming and Interfacing using 8085, 8086, 8051”, Tata McGraw Hill Education Private Limited. [for unit V].		

<b>Reference Books</b>	
1.	Mathur- “Introduction to Microprocessor”- 3rd Edition- Tata McGraw-Hill -1993.
2.	Raj Kamal - “Microcontrollers: Architecture, Programming, Interfacing and System Design”, Pearson Education, 2005.
3.	Krishna Kant, “Microprocessors and Microcontrollers – Architectures, Programming and System Design 8085, 8086, 8051, 8096”, PHI, 2008
<b>Web Resources</b>	
1.	Web resources from NDL Library, E-content from open source libraries
2.	<a href="https://www.bing.com/">https://www.bing.com/</a>

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	1	1	3	3	-
CO 2	2	3	1	1	1	1
CO 3	3	2	1	3	3	-
CO 4	3	3	1	2	3	-
CO 5	1	1	1	3	2	1
<b>Weightage of course contributed to each PSO</b>	12	10	5	12	12	2

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
	<b>Microprocessor and microcontroller Lab</b>		C	-	-	-	4	4	25	75	100
<b>Course Objective</b>											
LO1	To introduce the internal organization of Intel 8085 Microprocessor.										

LO2	To know about various instruction sets and classifications		
LO3	To enable the students to write assembly language programs using 8085.		
LO4	To interface the peripheral devices to 8085 using Interrupt controller and DMA interface.		
LO5	To provide real-life applications using microcontroller.		
	<b>Details</b>	<b>No. of Hours</b>	<b>C O</b>
	<b>List of Exercises:</b>		
	<p>Addition and Subtraction</p> <ol style="list-style-type: none"> <li>1. 8 - bit addition</li> <li>2. 16 - bit addition</li> <li>3. 8 - bit subtraction</li> <li>4. BCD subtraction</li> </ol> <p>II. Multiplication and Division</p> <ol style="list-style-type: none"> <li>1. 8 - bit multiplication</li> <li>2. BCD multiplication</li> <li>3. 8 - bit division</li> </ol> <p>III. Sorting and Searching</p> <ol style="list-style-type: none"> <li>1. Searching for an element in an array.</li> <li>2. Sorting in Ascending and Descending order.</li> <li>3. Finding the largest and smallest elements in an array.</li> <li>4. Reversing array elements.</li> <li>5. Block move.</li> </ol> <p>IV. Code Conversion</p> <ol style="list-style-type: none"> <li>1. BCD to Hex and Hex to BCD</li> <li>2. Binary to ASCII and ASCII to binary</li> <li>3. ASCII to BCD and BCD to ASCII</li> </ol> <p>V. Simple programs on 8051 Microcontroller</p> <ol style="list-style-type: none"> <li>1. Addition</li> <li>2. Subtraction</li> </ol>		

	3. Multiplication 4. Division 5. Interfacing Experiments using 8051 <ul style="list-style-type: none"> <li>I. Realisation of Boolean Expression through ports.</li> <li>II. Time delay generation using subroutines.</li> <li>III. Display LEDs through ports</li> </ul>		
	<b>Total</b>		<b>30</b>
<b>Course Outcomes</b>		<b>Programme Outcomea</b>	
CO	On completion of this course, students will		
1	Remember the Basic binary codes and their conversions. Binary concepts are used in Microprocessor programming and provide a good understanding of the architecture of 8085o introduce the internal organization of Intel 8085 Microprocessor..	Po1	
2	Understanding the 8085 instruction set and their classifications, enables the students to write the programs easily on their own using different logic	Po1,Po2	
3	Applying different types of instructions to convert binary codes and analyzing the outcome. The instruction set is applied to develop programs on multibyte arithmetic operations.	Po4,Po6	
4	Analyze how peripheral devices are connected to 8085 using Interrupts and DMA controller.	Po4,Po5,Po6	
5	An exposure to create real time applications using microcontroller.	Po3,Po8	
<b>Text Book</b>			
1	R. S. Gaonkar- "Microprocessor Architecture- Programming and Applications with 8085"- 5th Edition- Penram International Publications,2009. [For unit I to unit IV]		
2	Soumitra Kumar Mandal -"Microprocessors and Microcontrollers – Architectures, Programming and Interfacing using 8085, 8086, 8051", Tata McGraw Hill Education Private Limited. [for unit V].		

<b>Reference Books</b>	
1.	Mathur- “Introduction to Microprocessor”- 3rd Edition- Tata McGraw-Hill -1993.
2.	Raj Kamal - “Microcontrollers: Architecture, Programming, Interfacing and System Design”, Pearson Education, 2005.
3.	Krishna Kant, “Microprocessors and Microcontrollers – Architectures, Programming and System Design 8085, 8086, 8051, 8096”, PHI, 2008
<b>Web Resources</b>	
1.	Web resources from NDL Library, E-content from open source libraries
2.	<a href="https://www.bing.com/">https://www.bing.com/</a>

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	1	1	3	3	-
CO 2	2	3	1	1	1	1
CO 3	3	2	1	3	3	-
CO 4	3	3	1	2	3	-
CO 5	1	1	1	3	2	1
<b>Weightage of course contributed to each PSO</b>	12	10	5	12	12	2

**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
	<b>RDBMS with PL/SQL</b>	Elective	-	Y	-	-	4	5	25	75	100
<b>Course Objective</b>											
LO1	Describe basic concepts of database system										
LO2	Design a Data model and Schemas in RDBMS										

LO3	Competent in use of SQL	
LO4	Analyze functional dependencies for designing robust Database	
LO5	Describe basic concepts of database system	
<b>UNIT</b>	<b>Details</b>	<b>No. of Hours</b>
I	UNIT - I Introduction to DBMS– Data and Information - Database – Database Management System – Objectives - Advantages – Components - Architecture. ER Model: Building blocks of ER Diagram – Relationship Degree – Classification – ER diagram to Tables – ISA relationship – Constraints – Aggregation and Composition – Advantages	15
II	Relational Model: CODD’s Rule- Relational Data Model - Key - Integrity – Relational Algebra Operations – Advantages and limitations – Relational Calculus – Domain Relational Calculus - QBE.	15
III	Structure of Relational Database. Introduction to Relational Database Design - Objectives – Tools – Redundancy and Data Anomaly – Functional Dependency - Normalization – 1NF – 2NF – 3NF – BCNF. Transaction Processing – Database Security.	15
IV	UNIT - IV SQL: Commands – Data types – DDL - Selection, Projection, Join and Set Operations – Aggregate Functions – DML – Modification - Truncation - Constraints – Subquery.	15
V	UNIT - V PL/SQL: Structure - Elements – Operators Precedence – Control Structure – Iterative Control - Cursors - Procedure - Function - Packages – Exceptional Handling - Triggers.	15
	<b>Total</b>	<b>75</b>
	<b>Course Outcomes</b>	<b>Programme Outcome</b>
CO	On completion of this course, students will	
1	Understand basic concepts of database system	PO1
2	Design a Data model and Schemas in RDBMS	PO1, PO2
3	Understand Competent in use of SQL	PO4, PO6
4	Analyze functional dependencies for designing robust Database	PO4, PO5, PO6
5	Understand basic concepts of database system	PO3, PO8
	<b>Text Book</b>	
1	TEXT BOOK: 1. S. Sumathi, S. Esakkirajan, “Fundamentals of Relational Database Management System”, Springer International Edition 2007.	

<b>Reference Books</b>	
1.	REFERENCE BOOKS:
2.	1. Abraham Silberchatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGrawHill 2019, 7 <sup>th</sup> Edition.
3.	2. Alexis Leon & Mathews Leon, "Fundamentals of DBMS", Vijay Nicole Publications 2014, 2 <sup>nd</sup> Edition.
<b>Web Resources</b>	
1.	NPTEL & MOOC courses titled Relational Database Management Systems
2.	<a href="https://nptel.ac.in/courses/106106093/">https://nptel.ac.in/courses/106106093/</a>
3.	<a href="https://nptel.ac.in/courses/106106095/">https://nptel.ac.in/courses/106106095/</a>

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	2	1	3	-	-
CO 2	-	-	1	-	2	2
CO 3	3	2	1	3	-	-
CO 4	3	-	1	-	2	2
CO 5	3	2	1	3	2	2
<b>Weightage of course contributed to each PSO</b>	12	6	5	9	6	6

**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
	<b>PL/SQL Lab</b>	Core	Y	-	-	-	4	4	25	75	100
<b>Course Objective</b>											

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		
	<b>List of Exercises:</b>	<b>No. of Hours</b>	<b>Course Objective</b>
II	<p><b><i>I. SQL</i></b></p> <ol style="list-style-type: none"> <li>1. DDLCOMMANDS</li> <li>2. DMLCOMMANDS</li> <li>3. TCLCOMMANDS</li> </ol> <p><b><i>II. PL/SQL</i></b></p> <ol style="list-style-type: none"> <li>4. FIBONACCI SERIES</li> <li>5. FACTORIAL</li> <li>6. STRING REVERSE</li> <li>7. SUM OF SERIES</li> <li>8. TRIGGER</li> </ol> <p><b><i>III. CURSOR</i></b></p> <ol style="list-style-type: none"> <li>9. STUDENT MARK ANALYSIS USING CURSOR</li> </ol> <p><b><i>IV. APPLICATION</i></b></p> <ol style="list-style-type: none"> <li>10. LIBRARY MANAGEMENTSYSTEM</li> <li>11. STUDENT MARK ANALYSIS</li> </ol>		
	<b>Total</b>		
<b>Course Outcomes</b>		<b>Programme Outcomes</b>	
CO	On completion of this course, students will		
1	Understand the various basic concepts of Data Base	PO1	

	System. Difference between file system and DBMS and compare various data models.	
2	Define the integrity constraints. Understand the basic concepts of Relational Data Model, Entity-Relationship Model.	PO1, PO2
3	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
4	Classify the different functions and various join operations and enhance the knowledge of handling multiple tables.	PO4, PO5, PO6
5	Learn to design Data base operations and implement using PL/SQL programs. Learn basics of PL/SQL and develop programs using Cursors, Exceptions	PO3, PO8
<b>Text Book</b>		
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	
<b>Reference Books</b>		
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	
<b>Web Resources</b>		
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
CO 1	3	3	3	3	1	2
CO 2	2	3	3	3	1	2

<b>CO 3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>2</b>
<b>CO 4</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>2</b>
<b>CO 5</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>2</b>
<b>Weightage of course contributed to each PSO</b>	11	14	14	15	5	10

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

Subject Code	Subject Name	Category	L	T	P	S			Marks		
											Total
	<b>Software Engineering</b>	Core	Y	-	-	-	4	5	25	75	100
<b>Course Objectives</b>											
LO1	Gain basic knowledge of analysis and design of systems										
LO2	Ability to apply software engineering principles and techniques										
LO3	Model a reliable and cost-effective software system										
LO4	Ability to design an effective model of the system										
LO5	Perform Testing at various levels and produce an efficient system.										
UNIT	Details							No. of Hours	Course Objectives		
I	<p><b>Introduction:</b> The software engineering discipline, programs vs. software products, why study software engineering, emergence of software engineering, Notable changes in software development practices, computer systems engineering.</p> <p><b>Software Life Cycle Models:</b> Why use a life cycle model, Classical waterfall model, iterative waterfall model, prototyping model, evolutionary model, spiral model, comparison of different life cycle models.</p>							12	CO1		
II	<b>Requirements Analysis and Specification:</b>							12	CO2		

	<p>Requirements gathering and analysis, Software requirements specification (SRS)</p> <p><b>Software Design:</b> Good software design, cohesion and coupling, neat arrangement, software design approaches, object- oriented vs function-oriented design</p>		
III	<p><b>Function-Oriented Software Design:</b> Overview of SA/SD methodology, structured analysis, data flow diagrams (DFD's), structured design, detailed design.<b>User-Interface design:</b> Characteristics of a good interface; basic concepts; types of user interfaces; component based GUI development, a user interface methodology.</p>	12	CO3
IV	<p><b>Coding and Testing:</b> Coding; code review; testing; testing in the large vs testing in the small; unit testing; black-box testing; white-box testing; debugging; program analysis tools; integration testing; system testing; some general issues associated with testing.<b>Software Reliability and Quality Management:</b> Software reliability; statistical testing; software quality; software quality management system; SEI capability maturity model; personal software process.</p>	12	CO4
V	<p><b>Computer Aided Software Engineering:</b> CASE and its scope; CASE environment; CASE support in software life cycle; other characteristics of CASE tools; towards second generation CASE tool; architecture of a CASE environment. <b>Software Maintenance:</b> Characteristic of software maintenance; software reverse engineering; software maintenance process models; estimation of maintenance cost;</p>	12	CO5
	<b>Total</b>	<b>60</b>	

<b>Course Outcomes</b>		
<b>Course Outcomes</b>	On completion of this course, students will;	
<b>CO1</b>	Gain basic knowledge of analysis and design of systems	PO1
<b>CO2</b>	Ability to apply software engineering principles and techniques	PO1, PO2
<b>CO3</b>	Model a reliable and cost-effective software system	PO4, PO6
<b>CO4</b>	Ability to design an effective model of the system	PO4, PO5, PO6
<b>CO5</b>	Perform Testing at various levels and produce an efficient system.	PO3, PO8
<b>Text Books</b>		
1.	Rajib Mall, Fundamentals of Software Engineering, Fifth Edition, Prentice-Hall of India, 2018	
<b>References Books</b>		
1.	Richard Fairley, Software Engineering Concepts, Tata McGraw-Hill publishing company Ltd, Edition 1997	
2.	Roger S. Pressman, Software Engineering, Seventh Edition, McGraw-Hill.	
3.	James A. Senn, Analysis & Design of Information Systems, Second Edition, McGraw-Hill International Editions.	

**Mapping with Programme Outcomes:**

<b>CO/PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO 1</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>-</b>
<b>CO 2</b>	<b>3</b>	<b>-</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>2</b>
<b>CO 3</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>1</b>
<b>CO 4</b>	<b>3</b>	<b>-</b>	<b>2</b>	<b>2</b>	<b>-</b>	<b>1</b>
<b>CO 5</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>1</b>
<b>Weightage of course contributed to each</b>	<b>11</b>	<b>6</b>	<b>12</b>	<b>9</b>	<b>4</b>	<b>5</b>

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	<b>MACHINE LEARNING TECHNIQUES</b>		6	-	-	-	4	25	75	100
<b>Learning Objectives</b>										
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	<b>Introduction Machine Learning</b> - 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								<b>18</b>	
II	<b>Neural networks and genetic algorithms</b> 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.								<b>18</b>	
III	<b>Bayesian and computational learning</b> 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.								<b>18</b>	
IV	<b>Instant based learning</b> K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.								<b>18</b>	
V	<b>Advanced learning</b> 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								<b>18</b>	

	Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning.	
<b>TOTAL HOURS</b>		<b>90</b>
<b>Course Outcomes</b>		<b>Programme Outcomes</b>
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 theor	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Develop an appreciation for what is involved in learning from data.	PO1, PO2, PO3, PO4, PO5, PO6
<b>Textbooks</b>		
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	
<b>Reference Books</b>		
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

<b>CO 4</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>CO 5</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>
<b>Weightage of course contributed to each PSO</b>	<b>15</b>	<b>15</b>	<b>14</b>	<b>15</b>	<b>14</b>	<b>14</b>

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	MACHINE LEARNING LAB		-	-	5	-	4	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

<b>LAB EXERCISES</b>	Required Hour
<ol style="list-style-type: none"> <li>1. Solving Regression &amp; Classification using Decision Trees</li> <li>2. Root Node Attribute Selection for Decision Trees using Information Gain</li> <li>3. Bayesian Inference in Gene Expression Analysis</li> <li>4. Pattern Recognition Application using Bayesian Inference</li> <li>5. Bagging in Classification</li> <li>6. Bagging, Boosting applications using Regression Trees</li> <li>7. Data &amp; Text Classification using Neural Networks</li> <li>8. Using Weka tool for SVM classification for chosen domain application</li> <li>9. Data &amp; Text Clustering using K-means algorithm</li> <li>10. Data &amp; Text Clustering using Gaussian Mixture Models</li> </ol>	<b>75</b>

<b>Course Outcomes</b>	
CO	On completion of this course, students will
CO1	Effectively use the various machine learning tools
CO2	Understand and implement the procedures for machine learning algorithms CO3
CO3	Design Python programs for various machine learning algorithms
CO4	Apply appropriate datasets to the Machine Learning algorithms
CO5	Analyze the graphical outcomes of learning algorithms with specific datasets

### Mapping with Programme Outcomes:

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

<b>CO 2</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>2</b>
<b>CO 3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>2</b>
<b>CO 4</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>2</b>
<b>CO 5</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>2</b>
<b>Weightage of course contributed to each PSO</b>	11	15	15	15	5	10

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

Subject Code	Subject Name	Category	L	T	P	S			Marks		
											Total
	<b>Network Security</b>		Y	-	-	-	3	5	25	75	100
<b>Course Objectives</b>											
LO1	To familiarize on the model of network security, Encryption techniques										
LO2	To understand the concept of Number Theory , theorems										
LO3	To understand the design concept of cryptography and authentication										
LO4	To develop experiments on algorithm used for security										
LO5	To understand about virus and threats, firewalls, and implementation of										

Cryptography			
UNIT	Details	No. of Hours	Course Objectives
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	CO1
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	CO2
III	Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC – SHA - HMAC – CMAC - Digital signature and authentication protocols – DSS.	15	CO3
IV	Authentication applications – Kerberos – X.509 Authentication services - E- mail security – IP security - Web security	15	CO4
V	Intruder – Intrusion detection system – Virus and related threats – Countermeasures – Firewalls design principles – Trusted systems – Practical implementation of cryptography and security	15	CO5
<b>Total</b>		<b>75</b>	
<b>Course Outcomes</b>			
<b>Course Outcomes</b>	On completion of this course, students will;		
<b>CO1</b>	Analyze and design classical encryption techniques and block ciphers.	PO1, PO3, PO6, PO8	
<b>CO2</b>	Understand and analyze public-key cryptography, RSA and other public-key cryptosystems such as Diffie-	PO1,PO2,PO3,PO6	

	Hellman Key Exchange, ElGamal Cryptosystem, etc	
<b>CO3</b>	Understand key management and distribution schemes and design User Authentication	PO3, PO5
<b>CO4</b>	Analyze and design hash and MAC algorithms, and digital signatures.	PO1, PO2, PO3, PO7
<b>CO5</b>	Know about Intruders and Intruder Detection mechanisms, Types of Malicious software,	PO2, PO6, PO7
<b>Reference Text :</b>		
1.	William Stallings, "Cryptography & Network Security", Pearson Education, Fourth Edition 2010.	
<b>References :</b>		
1.	<b>CharlieKaufman,RadiaPerlman,MikeSpeciner,"NetworkSecurity,Privatecommunicationinpublicworld",PHISecondEdition,2002</b>	
2.	<b>Bruce Schneier, Neils Ferguson, "Practical Cryptography", Wiley Dreamtech India Pvt Ltd, First Edition, 2003.</b>	
3.	<b>DouglasRSimson"Cryptography–Theoryandpractice",CRCPress,FirstEdition,1995</b>	
<b>Web Resources</b>		
1.	<a href="https://www.javatpoint.com/computer-network-security">https://www.javatpoint.com/computer-network-security</a>	
2.	<a href="https://www.tutorialspoint.com/information_security_cyber_law/network_security.htm">https://www.tutorialspoint.com/information_security_cyber_law/network_security.htm</a>	
3.	<a href="https://www.geeksforgeeks.org/network-security/">https://www.geeksforgeeks.org/network-security/</a>	

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
<b>CO 1</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>
<b>CO 2</b>	<b>2</b>	<b>-</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>
<b>CO 3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>-</b>
<b>CO 4</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>-</b>
<b>CO 5</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>1</b>
<b>Weightage of course</b>	14	8	11	7	8	3

<b>contributed to each PSO</b>							
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**S-Strong-3 M-Medium-2 L-Low-1**

Subject Code	Subject Name	Category	L	T	P	S			Marks		
											Total
	<b>DataMiningAndWarehousing</b>		Y	-	-	-	2	2	25	75	100
<b>Course Objectives</b>											
LO1	To provide the knowledge on Data Mining and Warehousing concepts and techniques										
LO2	To study the basic concepts of Data Mining, Architecture and Comparison.										
LO3	To study a set of Mining Association Rules, Data Warehouses.										
LO4	To study about Classification and Prediction, Classifier Accuracy										
LO5	To study the basic concepts of cluster analysis, Cluster Methods										
UNIT	Details							No. of Hours	Course Objectives		
I	Introduction: Data mining – Functionalities – Classification – Introduction to Data Warehousing – Data Preprocessing: Preprocessing the Data – Data cleaning – Data Integration and Transformation – Data Reduction							15	CO1		
II	Data Mining, Primitives, Languages and System Architecture: Data Mining – Primitives – Data Mining Query Language, Architecture of Data mining Systems. Concept Description, Characterization and Comparison: Concept Description, Data Generalization and Summarization, Analytical Characterization, Mining Class Comparison – Statistical Measures.							15	CO2		
III	Mining Association Rules: Basic Concepts – Single Dimensional Boolean Association Rules From Transaction Databases, Multilevel Association Rules from transaction databases – Multi dimension Association Rules from Relational Database and Data							15	CO3		

	Warehouses.		
IV	Classification and Prediction: Introduction – Issues – Decision Tree Induction – Bayesian Classification – Classification of Back Propagation. Classification based on Concepts from Association Rule Mining – Other Methods. Prediction – Introduction – Classifier Accuracy	15	CO4
V	Cluster Analysis: Introduction – Types of Data in Cluster Analysis, Partitioning Methods – Hierarchical Methods-Density Based Methods – GRID Based Method – Model based Clustering Method	15	CO5
	<b>Total</b>	<b>75</b>	
<b>Course Outcomes</b>			
<b>Course Outcomes</b>	On completion of this course, students will;		
<b>CO1</b>	To understand the basic concepts and the functionality of the various data mining and data warehousing component	PO1, PO3, PO6, PO8	
<b>CO2</b>	To know the concepts of Data mining system architectures	PO1,PO2,PO3,PO6	
<b>CO3</b>	To analyze the principles of association rules	PO3, PO5	
<b>CO4</b>	To get analytical idea on Classification and prediction methods	PO1, PO2, PO3, PO7	
<b>CO5</b>	To Gain knowledge on Cluster analysis and its methods.	PO2, PO6, PO7	
<b>Text Books</b>			
<b>(Latest Editions)</b>			
1.	Han and M. Kamber, “Data Mining Concepts and Techniques”, 2001, Harcourt India Pvt. Ltd, New Delhi.		
<b>References Books</b>			
<b>(Latest editions)</b>			
1.	<b>K.P. Soman, ShyamDiwakar, V. Ajay “Insight into Data Mining Theory and Practice “,Prentice Hall of India Pvt. Ltd, New Delhi</b>		
2.	<b>Parteek Bhatia, ‘Data Mining and Data Warehousing: Principles and Practical Techniques’, Cambridge University Press, 2019</b>		

Web Resources	
1.	<a href="https://www.topcoder.com/thrive/articles/data-warehousing-and-data-mining#:~:text=Data%20warehousing%20is%20a%20method,compiled%20in%20the%20data%20warehouse.">https://www.topcoder.com/thrive/articles/data-warehousing-and-data-mining#:~:text=Data%20warehousing%20is%20a%20method,compiled%20in%20the%20data%20warehouse.</a>
2.	<a href="https://www.javatpoint.com/data-mining-cluster-vs-data-warehousing">https://www.javatpoint.com/data-mining-cluster-vs-data-warehousing</a>
3.	<a href="https://www.tutorialspoint.com/Data-Warehousing-and-Data-Mining">https://www.tutorialspoint.com/Data-Warehousing-and-Data-Mining</a>

### 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	2	2
CO 3	2	2	-	3	-	3
CO 4	3	3	2	3	1	1
CO 5	1	3	3	3	3	2
<b>Weightage of course contributed to each PSO</b>	<b>12</b>	<b>14</b>	<b>10</b>	<b>15</b>	<b>9</b>	<b>11</b>

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	<b><u>MOBILE APPLICATION DEVELOPMENT</u></b>		6	-	-	-	4	25	75	100
<b>Learning Objectives</b>										
LO1	Develop in-depth Knowledge about the architecture and features of Android									
LO2	Implementing the various options available in views.									
LO3	Understand the file handling concepts and thereby enabling to manage data efficiently.									
LO4	Able to describe clearly the features of SMS messaging.									
LO5	Illustrate the concepts of Location Based Services									
<b>UNIT</b>	<b>Contents</b>								<b>No. Of. Hours</b>	

I	<b>Android Fundamentals:</b> Android overview and Versions –Features of Android – Architecture of Android - Setting up Android Environment (Eclipse/Android Studio, SDK, AVD)- Anatomy of an Android Application - Simple Android Application Development.	<b>18</b>
II	<b>Android User Interface:</b> Layouts: Linear, Relative, Frame and Scrollview- Managing changes to Screen Orientation. Views: TextView, Button, ImageButton, EditText, CheckBox, RadioButton, RadioGroup, ProgressBar, AutoCompleteTextView, ListViews and WebView	<b>18</b>
III	<b>Data Persistence:</b> Saving and Loading User Preferences. File Handling: File System-Internal and External Storage-Permissions-File Manipulation-Managing Data using Sqlite: Creation of database-Insertion, Retrieval and Updation of records.	<b>18</b>
IV	<b>SMS Messaging:</b> Sending and Receiving messages - Sending E-mail–Networking: Downloading Binary Data – Downloading Text Files.	<b>18</b>
V	<b>Location Based Services:</b> Displaying maps- Displaying zoom control- Changing view – Adding Markers- Getting the location – Geo-coding Publishing Android Applications: Preparing for publishing-Deploying APK Files.	<b>18</b>
<b>TOTAL HOURS</b>		<b>90</b>
<b>Course Outcomes</b>		<b>Programme Outcomes</b>
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 theor	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Develop an appreciation for what is involved in learning from data.	PO1, PO2, PO3, PO4, PO5, PO6
<b>Textbooks</b>		
1	<b>WeiMeng Lee (2012), “Beginning Android Application Development”, WroxPublications (John Wiley, New York)</b>	
<b>Reference Books</b>		

1.	<b>Ed Burnette</b> , “ <i>Hello Android: Introducing Google's Mobile Development Platform</i> ”, 3rd edition, 2010, The Pragmatic Publishers.
2	<b>Reto Meier</b> , “ <i>Professional Android 4 Application Development</i> ”, 2012, Wrox Publications (John Wiley, New York).
<b>Web Resources</b>	
1.	<a href="https://www.tutorialspoint.com/mobile_development_tutorials.htm">https://www.tutorialspoint.com/mobile_development_tutorials.htm</a>
2	<a href="https://www.tutorialspoint.com">https://www.tutorialspoint.com</a> › Android › Android - Home

**Mapping with Programme Outcomes:**

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

S-Strong-3    M-Medium-2    L-Low-1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	<b><u>MOBILE APPLICATION DEVELOPMENT LAB</u></b>		4	-	-	-	4	25	75	100

**Course Objectives:**

- To explain user defined functions and the concepts of class.
- To demonstrate the creation cookies and sessions
- To facilitate the creation of Database and validate the user inputs

<b>Lab Exercises</b>		<b>Required Hours</b>
<ol style="list-style-type: none"> <li>1. Develop an application for Simple Counter.</li> <li>2. Develop an application to display your personal details using GUI Components.</li> <li>3. Develop a Simple Calculator that uses radio buttons and text view.</li> <li>4. Develop an application that uses Intent and Activity.</li> <li>5. Develop an application that uses Dialog Boxes.</li> <li>6. Develop an application to display a Splash Screen.</li> <li>7. Develop an application that uses Layout Managers.</li> <li>8. Develop an application that uses different types of Menus.</li> <li>9. Develop an application that uses to send messages from one mobile to another mobile.</li> <li>10. Develop an application that uses to send E-mail. Develop an application that plays Audio and Video.</li> <li>11. Develop an application that uses Local File Storage.</li> <li>12. Develop an application for Simple Animation.</li> <li>13. Develop an application for Login Page using Sqlite.</li> <li>14. Develop an application for Student Marksheet processing using Sqlite.</li> </ol>		<b>60</b>
<b>Course Outcomes</b>		
CO	On completion of this course, students will	
CO1	To understand the concepts of counter, dialogs.	
CO2	Concepts of Layout Managers. Perform sending email on audio and video To enable the applications of audio and video.	
CO3	To apply Local File Storage and Development of files.	
CO4	To determine the concepts of Simple Animation To apply searching pages.	
CO5	Usage of Student mark sheet- preparation in MAD. Concepts of processing Sqlite are implemented.	

**Mapping with Programme Outcomes:**

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

<b>CO 4</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>3</b>
<b>CO 5</b>	<b>2</b>	<b>2</b>	<b>-</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>Weightage of course contributed to each PSO</b>	11	8	3	14	14	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
	<b>Introduction to Data Science</b>		-	Y	-	-	4	4	25	75	100
<b>Course Objective</b>											
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	Details										No. of Hours
I	<b>Introduction:</b> Benefits and uses – Facts of data – Data science process – Big data ecosystem and data science										15
II	<b>The Data science process:</b> Overview – research goals - retrieving data - transformation – Exploratory Data Analysis – Model building .										15
III	<b>Algorithms :</b> Machine learning algorithms – Modeling process – Types – Supervised – Unsupervised - Semi-supervised										15
IV	<b>Introduction to Hadoop :</b> Hadoop framework – Spark – replacing MapReduce– NoSQL – ACID – CAP – BASE – types										15
V	<b>Case Study:</b> Prediction of Disease - Setting research goals - Data retrieval – preparation - exploration - Disease profiling - presentation										12

	and automation	
<b>Total</b>		<b>75</b>
<b>Course Outcomes</b>		<b>Programme Outcome</b>
CO	On completion of this course, students will	
1	Understand the basics in Data Science and Big data.	PO1
2	Understand overview and building process in Data Science.	PO1, PO2
3	Understand various Algorithms in Data Science.	PO4, PO6
4	Understand Hadoop Framework in Data Science.	PO4, PO5, PO6
5	Case study in Data Science.	PO3, PO8
<b>Text Book</b>		
1	Davy Cielen, Arno D. B. Meysman, Mohamed Ali, “Introducing Data Science”, manning publications 2016	
<b>Reference Books</b>		
1.	<b>Roger Peng, “The Art of Data Science”, lulu.com 2016.</b>	
2.	<b>MurtazaHaider, “Getting Started with Data Science – Making Sense of Data with Analytics”, IBM press, E-book.</b>	
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	
<b>Web Resources</b>		
1.	<a href="https://www.w3schools.com/datascience/">https://www.w3schools.com/datascience/</a>	
2.	<a href="https://en.wikipedia.org/wiki/Data_science">https://en.wikipedia.org/wiki/Data_science</a>	
3.	<a href="http://www.cmap.polytechnique.fr/~lepenec/en/post/references/refs/">http://www.cmap.polytechnique.fr/~lepenec/en/post/references/refs/</a>	

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	2	1	2	2	-
CO 2	2	3	2	2	-	1
CO 3	3	2	2	1	1	3
CO 4	1	2	2	1	3	1
CO 5	2	2	-	3	1	1
<b>Weightage of course contributed to each PSO</b>	11	11	7	9	7	6

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

### **Elective course – (1- 8)-Discipline Specific**

1. Software Metrics
2. Natural Language Processing
3. Analytics for Service Industry
4. Cryptography
5. Database Management System
6. Big Data Analytics
7. IOT and its Applications
8. Software Project Management
9. Image Processing
10. Information Security
11. Human Computer Interaction
12. Fuzzy Logic
13. Artificial Intelligence
14. Mobile Adhoc Network
15. Computational Intelligence
16. Grid Computing
17. Cloud Computing
18. Artificial Neural Network
19. Agile Project Management and more..

### **Elective course – (EC1-EC8)-Discipline Specific Syllabus**

#### **SOFTWARE METRICS**

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
	5	0	0	VI	4	5	25	75	100
<b>Learning Objectives</b>									
<b>LO1</b>	Gain a solid understanding of what software metrics are and their significance								
<b>LO2</b>	Learn how to identify and select appropriate software metrics based on project goals								
<b>LO3</b>	Acquire knowledge and skills in collecting and measuring software metrics								
<b>LO4</b>	Learn how to analyze and interpret software metrics data to extract valuable insights								
<b>LO5</b>	Gain the ability to evaluate software quality using appropriate metrics								
<b>Unit</b>	<b>Contents</b>								<b>No. of Hours</b>
I	<b>Fundamentals of Measurement: Need for Measurement:</b> Measurement in Software Engineering, Scope of Software Metrics, <b>The Basics of measurement:</b> The representational theory of measurement, Measurement and models, Measurement scales and scale types, meaningfulness in measurement								<b>15</b>
II	<b>A Goal-Based Framework For Software Measurement:</b> Classifying software measures, Determining what to Measure, Applying the framework, Software measurement validation, Performing SoftwareMeasurementValidation <b>Empirical investigation:</b> Principles of Empirical Studies, Planning Experiments, Planning case studies as quasi-experiments, Relevant and Meaningful Studies								<b>15</b>
III	<b>Software Metrics Data Collection:</b> Defining good data, Data collection for incident reports, How to collect data, Reliability of data collection Procedures <b>Analyzing software measurement data:</b> Statistical distributions and hypothesis testing, Classical data analysis techniques, Examples of simple analysis techniques								<b>15</b>
IV	<b>Measuring internal product attributes: Size</b> Properties of Software Size, Code size, Design size, Requirements analysis and Specification size, Functional size measures and estimators, Applications of size measures <b>Measuring internal product attributes: Structure:</b> Aspects of Structural Measures, Control flow structure of program units, Design-levelAttributes,								<b>15</b>

	Object-oriented Structural attributes and measures	
V	<b>Measuring External Product Attributes:</b> Modelling software quality, Measuring aspects of quality, Usability Measures, Maintainability measures, Security Measures <b>Software Reliability: Measurement and Prediction:</b> Basics of reliability theory, The software reliability problem, Parametric reliability growth models, Predictive accuracy	<b>15</b>
<b>TOTAL</b>		<b>75</b>
<b>CO</b>	<b>Course Outcomes</b>	
CO1	Understand various fundamentals of measurement and software metrics	
CO2	Identify frame work and analysis techniques for software measurement	
CO3	Apply internal and external attributes of software product for effort estimation	
CO4	Use appropriate analytical techniques to interpret software metrics data and derive meaningful insights	
CO5	Recommend reliability models for predicting software quality	
<b>Textbooks</b>		
➤	Software Metrics A Rigorous and Practical Approach, Norman Fenton, James Bieman , Third Edition, 2014	
Reference Books		
1	Software metrics, Norman E, Fenton and Shari Lawrence Pfleeger, International Thomson Computer Press, 1997	
2	Metric and models in software quality engineering, Stephen H.Kan, Second edition, 2002, Addison Wesley Professional	
3	Practical Software Metrics for Project Management and Process Improvement, Robert B.Grady, 1992, Prentice Hall.	
<b>NOTE: Latest Edition of Textbooks May be Used</b>		
<b>Web Resources</b>		
1.	<a href="https://lansa.com/blog/general/what-are-software-metrics-how-can-i-measure-these-metrics/">https://lansa.com/blog/general/what-are-software-metrics-how-can-i-measure-these-metrics/</a>	
2.	<a href="https://stackify.com/track-software-metrics/">https://stackify.com/track-software-metrics/</a>	

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	2	2	-	3	3	2
CO 2	3	1	2	3	3	3
CO 3	3	1	1	2	3	3
CO 4	2	3	2	3	2	3
CO 5	2	2	-	3	3	3
<b>Weightage of course contributed to each PSO</b>	12	9	5	14	14	14

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	<b>NATURAL LANGUAGE PROCESSING</b>	<b>Elect</b>	5	-	-	-	3	25	75	100
<b>Learning Objectives</b>										
<b>LO1</b>	To understand approaches to syntax and semantics in NLP.									
<b>LO2</b>	To learn natural language processing and to learn how to apply basic algorithms in this field.									
<b>LO3</b>	To understand approaches to discourse, generation, dialogue and summarization within NLP.									
<b>LO4</b>	To get acquainted with the algorithmic description of the main language levels: morphology, syntax, semantics, pragmatics etc.									
<b>LO5</b>	To understand current methods for statistical approaches to machine translation.									
<b>UNIT</b>	<b>Contents</b>								<b>No. Of. Hours</b>	

I	<b>Introduction</b> : 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.	<b>15</b>
II	<b>Word level and Syntactic Analysis:</b> 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.	<b>15</b>
III	<b>Semantic analysis and Discourse Processing:</b> Semantic Analysis: Meaning Representation-Lexical Semantics- Ambiguity-Word Sense Disambiguation. Discourse Processing: cohesion-Reference Resolution- Discourse Coherence and Structure.	<b>15</b>
IV	<b>Natural Language Generation:</b> 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.	<b>15</b>
V	<b>Information retrieval and lexical resources:</b> 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.	<b>15</b>
<b>Course Outcomes</b>		<b>Programme Outcomes</b>
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 of text data.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Use appropriate descriptions, visualizations, and statistics to communicate the problems and their solutions.	PO1, PO2, PO3, PO4, PO5, PO6

	Use NLP methods to analyse sentiment of a text document.	
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
<b>Textbooks</b>		
1	Daniel Jurafsky, James H. Martin, "Speech & language processing", Pearson publications.	
2	Allen, James. Natural language understanding. Pearson, 1995.	
<b>Reference Books</b>		
1.	Pierre M. Nugues, "An Introduction to Language Processing with Perl and Prolog", Springer	
<b>Web Resources</b>		
1.	<a href="https://en.wikipedia.org/wiki/Natural_language_processing">https://en.wikipedia.org/wiki/Natural_language_processing</a>	
2.	<a href="https://www.techtarget.com/searchenterpriseai/definition/natural-language-processing-NLP">https://www.techtarget.com/searchenterpriseai/definition/natural-language-processing-NLP</a>	

**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	1
CO 2	2	3	3	3	2	3
CO 3	1	3	3	3	1	3
CO 4	3	2	1	3	2	3
CO 5	3	3	3	3	3	3
<b>Weightage of course contributed to each PSO</b>	12	14	13	15	11	13

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	<b>ANALYTICS FOR SERVICE INDUSTRY</b>	<b>Elective</b>	5	-	-	-	3	25	75	100
<b>Learning Objectives</b>										
<b>LO1</b>	Recognize challenges in dealing with data sets in service industry.									
<b>LO2</b>	Identify and apply appropriate algorithms for analyzing the healthcare, Human resource, hospitality and tourism data.									
<b>LO3</b>	Make choices for a model for new machine learning tasks.									
<b>LO4</b>	To identify employees with high attrition risk.									
<b>LO5</b>	To Prioritizing various talent management initiatives for your organization.									
<b>UNIT</b>	<b>Contents</b>								<b>No. Of Hours</b>	
I	<b>Healthcare Analytics :</b> Introduction to Healthcare Data Analytics- Electronic Health Records– Components of EHR- Coding Systems- Benefits of EHR- Barrier to Adopting HER Challenges-Phenotyping Algorithms. Biomedical Image Analysis and Signal Analysis- Genomic Data Analysis for Personalized Medicine. Review of Clinical Prediction Models.								<b>15</b>	
II	<b>Healthcare Analytics Applications :</b> Applications and Practical Systems for Healthcare– Data Analytics for Pervasive Health- Fraud Detection in Healthcare- Data Analytics for Pharmaceutical Discoveries- Clinical Decision Support Systems- Computer- Assisted Medical Image Analysis Systems- Mobile Imaging and Analytics for Biomedical Data.								<b>15</b>	
III	<b>HR Analytics:</b> Evolution of HR Analytics, HR information systems and data sources, HR Metric and HR Analytics, Evolution of HR Analytics; HR Metrics and HR Analytics; Intuition versus analytical thinking; HRMS/HRIS and data sources; Analytics frameworks like LAMP, HCM:21(r) Model.								<b>15</b>	
IV	<b>Performance Analysis:</b> Predicting employee performance, Training requirements, evaluating training and development, Optimizing								<b>15</b>	

	selection and promotion decisions.	
V	<b>Tourism and Hospitality Analytics:</b> Guest Analytics – Loyalty Analytics – Customer Satisfaction – Dynamic Pricing – optimized disruption management – Fraud detection in payments.	<b>15</b>
<b>TOTAL HOURS</b>		<b>75</b>
<b>Course Outcomes</b>		<b>Programme Outcomes</b>
CO	On completion of this course, students will	
CO1	Understand and critically apply the concepts and methods of business analytics	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Identify, model and solve decision problems in different settings.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Interpret results/solutions and identify appropriate courses of action for a given managerial situation whether a problem or an opportunity.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Create viable solutions to decision making problems.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Instill a sense of ethical decision-making and a commitment to the long-run welfare of both organizations and the communities they serve.	PO1, PO2, PO3, PO4, PO5, PO6
<b>Textbooks</b>		
1	Chandan K. Reddy and Charu C Aggarwal, “Healthcare data analytics”, Taylor & Francis, 2015.	
2	Edwards Martin R, Edwards Kirsten (2016), “Predictive HR Analytics: Mastering the HR Metric”, Kogan Page Publishers, ISBN-0749473924	
3	Fitz-enzJac (2010), “The new HR analytics: predicting the economic value of your company’s human capital investments”, AMACOM, ISBN-13: 978-0-8144-1643-3	
4	RajendraSahu, Manoj Dash and Anil Kumar. Applying Predictive Analytics Within the Service Sector.	
<b>Reference Books</b>		
1.	Hui Yang and Eva K. Lee, “Healthcare Analytics: From Data to Knowledge to Healthcare Improvement, Wiley, 2016	
2.	Fitz-enzJac, Mattox II John (2014), “Predictive Analytics for Human Resources”, Wiley, ISBN- 1118940709.	
<b>Web Resources</b>		
1.	<a href="https://www.ukessays.com/essays/marketing/contemporary-issues-in-">https://www.ukessays.com/essays/marketing/contemporary-issues-in-</a>	

	marketing-marketing-essay.php
2.	<a href="https://yourbusiness.azcentral.com/examples-contemporary-issues-marketing-field-26524.html">https://yourbusiness.azcentral.com/examples-contemporary-issues-marketing-field-26524.html</a>

**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	3	3
CO 3	3	3	2	3	3	2
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	3	3
<b>Weightage of course contributed to each PSO</b>	14	15	14	15	15	14

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	<b>CRYPTOGRAPHY</b>	<b>Elect</b>	4	-	-	-	3	25	75	100
<b>Learning Objectives</b>										
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	<b>Introduction:</b> The OSI security Architecture – Security Attacks – Security Mechanisms – Security Services – A model for network Security.									<b>12</b>
II	<b>Classical Encryption Techniques:</b> Symmetric cipher model – <b>Substitution Techniques:</b> Caesar Cipher – Monoalphabetic cipher – Play fair cipher – Poly Alphabetic Cipher – Transposition techniques – Stenography									<b>12</b>
III	<b>Block Cipher and DES:</b> Block Cipher Principles – DES – The									<b>12</b>

	Strength of DES – <b>RSA</b> : The RSA algorithm.	
IV	<b>Network Security Practices</b> : IP Security overview - IP Security architecture – Authentication Header. <b>Web Security</b> : SecureSocket Layer and Transport Layer Security – Secure Electronic Transaction.	<b>12</b>
V	Intruders – Malicious software – Firewalls.	<b>12</b>
<b>TOTAL HOURS</b>		<b>60</b>
<b>Course Outcomes</b>		<b>Programme Outcomes</b>
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	Apply the different cryptographic operations of symmetric cryptographic algorithms	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
<b>Textbooks</b>		
1	<b>William Stallings</b> , “Cryptography and Network Security Principles and Practices”.	
<b>Reference Books</b>		
1.	<b>Behrouz A. Foruzan</b> , “Cryptography and Network Security”, Tata McGraw-Hill, 2007.	
2	<b>Atul Kahate</b> , “ <i>Cryptography and Network Security</i> ”, Second Edition, 2003, TMH.	
3	<b>M.V. Arun Kumar</b> , “ <i>Network Security</i> ”, 2011, First Edition, USP.	
<b>Web Resources</b>		
1	<a href="https://www.tutorialspoint.com/cryptography/">https://www.tutorialspoint.com/cryptography/</a>	
2	<a href="https://gpgtools.tenderapp.com/kb/how-to/introduction-to-cryptography">https://gpgtools.tenderapp.com/kb/how-to/introduction-to-cryptography</a>	

**Mapping with Programme Outcomes:**

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

<b>CO 2</b>	3	2	3	2	3	3
<b>CO 3</b>	2	3	2	2	2	1
<b>CO 4</b>	2	3	3	1	2	3
<b>CO 5</b>	3	2	3	3	3	3
<b>Weightage of course contributed to each PSO</b>	13	13	12	10	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
	<b>Database Management System</b>	Core	Y	-	-	-	4	5	25	75	100
<b>Course Objective</b>											
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	Details							No. of Hours	Course Objective		
	<b>Database Concepts:</b> 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	CO1		

II	<b>Design Concepts:</b> 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	CO2
III	<b>Normalization of Database Tables:</b> Database tables and Normalization – The Need for Normalization –The Normalization Process – Higher level Normal Form.  <b>Introduction to SQL:</b> Data Definition Commands – Data Manipulation Commands – SELECT Queries – Additional Data Definition Commands – Additional SELECT Query Keywords – Joining Database Tables.	15	CO3
IV	<b>Advanced SQL:</b> Relational SET Operators: UNION – UNION ALL – INTERSECT - MINUS.SQL Join Operators: Cross Join – Natural Join – Join USING Clause – JOIN ON Clause – Outer Join. <b>Sub Queries and Correlated Queries:</b> WHERE – IN – HAVING – ANY and ALL – FROM. SQL Functions: Date and Time Function – Numeric Function – String Function – Conversion Function	15	CO4
V	<b>PL/SQL:</b> A Programming Language: History – Fundamentals – Block Structure – Comments – Data Types – Other Data Types – Variable Declaration – Assignment operation –Arithmetic operators. <b>Control Structures and Embedded SQL:</b> Control Structures – Nested Blocks – SQL in PL/SQL – Data Manipulation – Transaction Control statements. <b>PL/SQL Cursors and Exceptions:</b> Cursors – Implicit Cursors, Explicit Cursors and Attributes – Cursor FOR loops – SELECT...FOR UPDATE – WHERE CURRENT OF clause – Cursor with Parameters – Cursor Variables –	15	CO5

	Exceptions – Types of Exceptions.		
	<b>Total</b>	<b>75</b>	
<b>Course Outcomes</b>		<b>Programme Outcomes</b>	
CO	On completion of this course, students will		
1	Understand the various basic concepts of Data Base System. Difference between file system and DBMS and compare various data models.	PO1	
2	Define the integrity constraints. Understand the basic concepts of Relational Data Model, Entity-Relationship Model.	PO1, PO2	
3	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	
4	Classify the different functions and various join operations and enhance the knowledge of handling multiple tables.	PO4, PO5, PO6	
5	Learn to design Data base operations and implement using PL/SQL programs. Learn basics of PL/SQL and develop programs using Cursors, Exceptions	PO3, PO8	
<b>Text Book</b>			
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		
<b>Reference Books</b>			
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		
<b>Web Resources</b>			
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
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
<b>Weightage of course contributed to each PSO</b>	15	15	14	15	14	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
	<b>Big Data Analytics</b>		Y	-	-	-	3	5	25	75	100
<b>Course Objective</b>											
LO1	Understand the Big Data Platform and its Use cases, Map Reduce Jobs										
LO2	To identify and understand the basics of cluster and decision tree										
LO3	To study about the Association Rules, Recommendation System										
LO4	To learn about the concept of stream										
LO5	Understand the concepts of NoSQL Databases										
UNIT	Details						No. of Hours	Course Objective			
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						15	C1			

	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		
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.	15	C2
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.	15	C3
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	15	C4

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.	15	C5
<b>Total</b>		<b>75</b>	
<b>Course Outcomes</b>		<b>Programme Outcomes</b>	
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, PO8	
<b>Text Book</b>			
1	AnandRajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.		
<b>Reference Books</b>			
1.	<b>David Loshin, “Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph”, Morgan Kaufmann/El sevier Publishers, 2013</b>		
2.	EMC Education Services, “Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data”, Wiley publishers, 2015.		
<b>Web Resources</b>			
1.	<a href="https://www.simplilearn.com">https://www.simplilearn.com</a>		
2.	<a href="https://www.sas.com/en_us/insights/analytics/big-data-analytics.html">https://www.sas.com/en_us/insights/analytics/big-data-analytics.html</a>		

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
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<b>CO 1</b>	1	3	2	2	3	1
<b>CO 2</b>	3	2	3	2	3	3
<b>CO 3</b>	1	3	2	2	2	1
<b>CO 4</b>	3	3	3	1	3	3
<b>CO 5</b>	3	2	3	3	3	3
<b>Weightage of course contributed to each PSO</b>	11	13	13	10	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
	<b>Internet of Things and its applications</b>		Y	-	-	-	4	5	25	75	100
<b>Course Objective</b>											
LO1	Use of Devices, Gateways and Data Management in IoT.										
LO2	Design IoT applications in different domain and be able to analyze their performance										
LO3	Implement basic IoT applications on embedded platform										
LO4	To gain knowledge on Industry Internet of Things										
LO5	To Learn about the privacy and Security issues in IoT										
UNIT	Details						No. of Hours	Course Objective			
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.						15	C1			
II	M2M to IoT – A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value						15	C2			

	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.		
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	15	C3
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 Gas Industry, Opinions on IoT Application and Value for Industry, Home Management	15	C4
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	15	C5
<b>Total</b>		<b>75</b>	
<b>Course Outcomes</b>		<b>Programme Outcomes</b>	
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, PO8
<b>Text Book</b>		
1	Vijay Madiseti and Arshdeep Bahga, “Internet of Things: (A Hands-on Approach)”, Universities Press (INDIA) Private Limited 2014, 1st Edition.	
<b>Reference Books</b>		
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	
<b>Web Resources</b>		
1.	<a href="https://www.simplilearn.com">https://www.simplilearn.com</a>	
2.	<a href="https://www.javatpoint.com">https://www.javatpoint.com</a>	
3.	<a href="https://www.w3schools.com">https://www.w3schools.com</a>	

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	2	-	-	2	-	2
CO 2	2	1	-	1	3	1
CO 3	3	-	1	1	-	1
CO 4	2	-	-	2	1	2
CO 5	2	-	-	2	-	2
<b>Weightage of course contributed to each PSO</b>	11	1	1	8	4	8

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

### SOFTWARE PROJECT MANAGEMENT

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
	5	0	0	VI	4	5	25	75	100
<b>Learning Objectives</b>									
<b>LO1</b>	To define and highlight importance of software project management.								
<b>LO2</b>	To formulate and define the software management metrics & strategy in managing projects								
<b>LO3</b>									
<b>LO4</b>	Understand to apply software testing techniques in commercial environment								
<b>Unit</b>	<b>Contents</b>								<b>No. of Hours</b>
I	<b>Introduction to Competencies - Product Development Techniques - Management Skills - Product Development Life Cycle - Software Development Process and models - The SEI CMM - International Organization for Standardization.</b>								<b>15</b>
II	<b>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.</b>								<b>15</b>
III	<b>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.</b>								<b>15</b>
IV	<b>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.</b>								<b>15</b>
V	<b>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</b>								<b>15</b>
<b>TOTAL</b>								<b>75</b>	
<b>CO</b>	<b>Course Outcomes</b>								

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
<b>Textbooks</b>	
➤	Robert T. Futrell, Donald F. Shafer, Linda I. Safer, “Quality Software Project Management”, Pearson Education Asia 2002.
<b>Reference Books</b>	
1.	Pankaj Jalote, “Software Project Management in Practice”, Addison Wesley 2002.
2.	Hughes, “Software Project Management”, Tata McGraw Hill 2004, 3rd Edition.
<b>NOTE: Latest Edition of Textbooks May be Used</b>	
<b>Web Resources</b>	
1.	NPTEL & MOOC courses titled Software Project Management
2.	<a href="http://www.smartworld.com/notes/software-project-management">www.smartworld.com/notes/software-project-management</a>

<b>MAPPING TABLE</b>						
<b>CO/PSO</b>	<b>PSO1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	<b>2</b>	<b>2</b>	<b>-</b>	<b>3</b>	<b>3</b>	<b>1</b>
<b>CO2</b>	<b>2</b>	<b>1</b>	<b>-</b>	<b>3</b>	<b>3</b>	<b>-</b>
<b>CO3</b>	<b>3</b>	<b>-</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>3</b>
<b>CO4</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>-</b>
<b>CO5</b>	<b>2</b>	<b>2</b>	<b>-</b>	<b>3</b>	<b>3</b>	<b>3</b>
<b>Weightageof coursecontributed toeachPSO</b>	<b>11</b>	<b>8</b>	<b>3</b>	<b>14</b>	<b>14</b>	<b>7</b>

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	<b>Image Processing</b>	Elective	-	Y	-	-	3	5	25	75	100
<b>Course Objective</b>											
LO1	To learn fundamentals of digital image processing.										
LO2	To learn about various 2D Image transformations										
LO3	To learn about various image enhancement processing methods and filters										
LO4	To learn about various classification of Image segmentation techniques										
LO5	To learn about various image compression techniques										
UNIT	Details										No. of Hours
I	<b>Digital Image Fundamentals:</b> Image representation - Basic relationship between pixels, Elements of DIP system -Applications of Digital Image Processing - 2D Systems - Classification of 2D Systems - Mathematical Morphology- Structuring Elements- Morphological Image Processing - 2D Convolution - 2D Convolution Through Graphical Method -2D Convolution Through Matrix Analysis										15
II	2D Image transforms: Properties of 2D-DFT - Walsh transform - Hadamard transform- Haar transform- Discrete Cosine Transform- Karhunen-Loeve Transform -Singular Value Decomposition										15
III	Image Enhancement: Spatial domain methods- Point processing- Intensity transformations - Histogram processing- Spatial filtering- smoothing filter- Sharpening filters - Frequency domain methods: low pass filtering, high pass Filtering- Homomorphic filter.										15
IV	Image segmentation: Classification of Image segmentation techniques - Region approach – Clustering techniques - Segmentation based on thresholding - Edge based segmentation - Classification of edges- Edge detection - Hough transform- Active contour.										15
V	Image Compression: Need for compression -Redundancy- Classification										15

	of image- Compression schemes- Huffman coding- Arithmetic coding- Dictionary based compression -Transform based compression,	
<b>Total</b>		<b>75</b>
<b>Course Outcomes</b>		<b>Programme Outcome</b>
CO	On completion of this course, students will	
1	Understand the fundamental concepts of digital image processing.	PO1
2	Understand various 2D Image transformations	PO1, PO2
3	Understand image enhancement processing techniques and filters	PO4, PO6
4	Understand the classification of Image segmentation techniques	PO4, PO5, PO6
5	Understand various image compression techniques	PO3, PO8
<b>Text Book</b>		
1	S Jayaraman, S Esakkirajan, T Veerakumar, Digital image processing ,Tata McGraw Hill, 2015	
2	Gonzalez Rafel C, Digital Image Processing, Pearson Education, 2009	
<b>Reference Books</b>		
1.	2. Jain Anil K , Fundamentals of digital image processing: , PHI,1988	
2.	Kenneth R Castleman , Digital image processing:, Pearson Education,2/e,2003	
3.	Pratt William K , Digital Image Processing: , John Wiley,4/e,2007	
<b>Web Resources</b>		
1.	<a href="https://kanchiuniv.ac.in/coursematerials/Digital%20image%20processing%20-Vijaya%20Raghavan.pdf">https://kanchiuniv.ac.in/coursematerials/Digital%20image%20processing%20-Vijaya%20Raghavan.pdf</a>	
2.	<a href="http://sdeuoc.ac.in/sites/default/files/sde_videos/Digital%20Image%20Processing%203rd%20ed.%20-%20R.%20Gonzalez%2C%20R.%20Woods-ilovepdf-compressed.pdf">http://sdeuoc.ac.in/sites/default/files/sde_videos/Digital%20Image%20Processing%203rd%20ed.%20-%20R.%20Gonzalez%2C%20R.%20Woods-ilovepdf-compressed.pdf</a>	
3.	<a href="https://dl.acm.org/doi/10.5555/559707">https://dl.acm.org/doi/10.5555/559707</a>	
4.	<a href="https://www.ijert.org/image-processing-using-web-2-0-2">https://www.ijert.org/image-processing-using-web-2-0-2</a>	

**Mapping with Programme Outcomes:**

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

<b>CO 3</b>	3	3	2	2	2	1
<b>CO 4</b>	3	3	3	1	3	3
<b>CO 5</b>	3	2	3	3	3	3
<b>Weightage of course contributed to each PSO</b>	13	13	13	10	14	11

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

Subject Code	Subject Name	Category	L	T	P	S			Marks		
											Total
	<b>Information Security</b>	<b>Elective</b>	Y	-	-	-	3	5	25	75	100
<b>Course Objectives</b>											
LO1	To know the objectives of information security										
LO2	Understand the importance and application of each of confidentiality, integrity, authentication and availability										
LO3	Understand various cryptographic algorithms										
LO4	Understand the basic categories of threats to computers and networks										
LO5	To study about the concepts of security in networks, web security										
UNIT	Details							No. of Hours	Course Objectives		
I	Introduction to Information Security : Security mindset, Computer Security Concepts (CIA), Attacks, Vulnerabilities and protections, Security Goals, Security Services, Threats, Attacks, Assets, malware, program analysis and mechanisms							15	CO1		
II	The Security Problem in Computing: The meaning of computer Security, Computer Criminals, Methods of Defense. Cryptography: Concepts and Techniques: Introduction, plain text							15	CO2		

	and cipher text, substitution techniques, transposition techniques, encryption and decryption		
III	Symmetric and Asymmetric Cryptographic Techniques : DES, AES, RSA algorithms .Authentication and Digital Signatures : Use of Cryptography for authentication, Secure Hash function, Key management – Kerberos	15	CO3
IV	Program Security : Non-malicious Program errors – Buffer overflow, Incomplete mediation, Time-of-check to Time-of- use Errors, Viruses, Trapdoors, Salami attack, Man-in-the- middle attacks, Covert channels. File protection Mechanisms, User Authentication Designing Trusted O.S: Security polices, models of security, trusted O.S design, Assurance in trusted O.S. Implementation examples	15	CO4
V	Security in Networks : Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security. Web Security: Web security considerations, Secure Socket Layer and Transport Layer Security, Secure electronic transaction	15	CO5
	<b>Total</b>	<b>75</b>	
<b>Course Outcomes</b>			
<b>Course Outcomes</b>	On completion of this course, students will;	<b>Programme Outcomes</b>	
<b>CO1</b>	Understand network security threats, security services, and countermeasures	PO1	
<b>CO2</b>	Understand vulnerability analysis of network security	PO1, PO2	
<b>CO3</b>	Acquire background on hash functions; authentication; firewalls; intrusion detection techniques	PO4, PO6	
<b>CO4</b>	Gain hands-on experience with programming and	PO4, PO5, PO6	

	simulation techniques for security protocols.	
<b>CO5</b>	Apply methods for authentication, access control, intrusion detection and prevention	PO3, PO8
<b>Text Books</b> <b>(Latest Editions)</b>		
1.	Security in Computing, Fourth Edition, by Charles P. Pfleeger, Pearson Education	
2.	Cryptography And Network Security Principles And Practice, Fourth or Fifth Edition, William Stallings, Pearson	
<b>References Books</b> <b>(Latest editions, and the style as given below must be strictly adhered to)</b>		
1.	Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition	
2.	Cryptography and Network Security : Forouzan Mukhopadhyay, Mc Graw Hill, 2 <sup>nd</sup> Edition	
3.	Information Security, Principles and Practice: Mark Stamp, Wiley India	
4.	Principles of Computer Security: WM.Arthur Conklin, Greg White, TMH	
<b>Web Resources</b>		
1.	<a href="https://www.geeksforgeeks.org/what-is-information-security/">https://www.geeksforgeeks.org/what-is-information-security/</a>	
2.	<a href="https://www.tutorialspoint.com/what-is-information-security#:~:text=Information%20security%20is%20designed%20and,destruction%2C%20alteration%2C%20and%20disruption.">https://www.tutorialspoint.com/what-is-information-security#:~:text=Information%20security%20is%20designed%20and,destruction%2C%20alteration%2C%20and%20disruption.</a>	

**Mapping with Programme Outcomes:**

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

<b>CO 5</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>2</b>
<b>Weightage of course contributed to each PSO</b>	8	12	5	11	12	6

**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
	<b>Human Computer Interaction</b>	Elective	-	Y	-	-	3	5	25	75	100
<b>Course Objective</b>											
LO1	To learn about the foundations of Human Computer Interaction.										
LO2	To learn the design and software process technologies.										
LO3	To learn HCI models and theories.										
LO4	To learn Mobile Ecosystem.										
LO5	To learn the various types of Web Interface Design.										
UNIT	Details										No. of Hours
I	<b>FOUNDATIONS OF HCI :</b> <ul style="list-style-type: none"> <li>• The Human: I/O channels – Memory</li> <li>• Reasoning and problem solving; The Computer: Devices – Memory – processing and networks;</li> <li>• Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. - Case Studies</li> </ul>										15
II	<b>DESIGN &amp; SOFTWARE PROCESS:</b> <ul style="list-style-type: none"> <li>• Interactive Design:</li> <li>• Basics – process – scenarios</li> <li>• Navigation: screen design Iteration and prototyping.</li> <li>• HCI in software process:</li> <li>• Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards,</li> </ul>										15

	guidelines, rules. Evaluation Techniques – Universal Design	
III	<b>MODELS AND THEORIES:</b> <ul style="list-style-type: none"> <li>HCI Models : Cognitive models:- Socio-Organizational issues and stakeholder requirements Communication and collaboration models-Hypertext, Multimedia and WWW.</li> </ul>	15
IV	<b>Mobile HCI:</b> <ul style="list-style-type: none"> <li>Mobile Ecosystem: Platforms, Application frameworks</li> <li>Types of Mobile Applications: Widgets, Applications, Games</li> <li>Mobile Information Architecture, Mobile 2.0,</li> <li>Mobile Design: Elements of Mobile Design, Tools. - Case Studies</li> </ul>	15
V	<b>WEB INTERFACE DESIGN:</b> Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow - Case Studies	15
<b>Total</b>		<b>75</b>
<b>Course Outcomes</b>		<b>Programme Outcome</b>
CO	On completion of this course, students will	
1	Understand the fundamentals of HCI.	PO1
2	Understand the design and software process technologies.	PO1, PO2
3	Understand HCI models and theories.	PO4, PO6
4	Understand Mobile Ecosystem, types of Mobile Applications, mobile Architecture and design.	PO4, PO5, PO6
5	Understand the various types of Web Interface Design.	PO3, PO8
<b>Text Book</b>		
1	Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human -Computer Interaction", III Edition, Pearson Education, 2004 (UNIT I, II & III)	
2	Brian Fling, —"Mobile Design and Development", I Edition, O'Reilly Media Inc., 2009(UNIT-IV)	
3	Bill Scott and Theresa Neil, —Designing Web Interfaces, First Edition, O'Reilly, 2009. (UNIT-V)	

<b>Reference Books</b>	
1.	Shneiderman, “Designing the User Interface: Strategies for Effective Human-Computer Interaction”, V Edition, Pearson Education.
<b>Web Resources</b>	
1.	<a href="https://www.interaction-design.org/literature/topics/human-computer-interaction">https://www.interaction-design.org/literature/topics/human-computer-interaction</a>
2.	<a href="https://link.springer.com/10.1007/978-0-387-39940-9_192">https://link.springer.com/10.1007/978-0-387-39940-9_192</a>
3.	<a href="https://en.wikipedia.org/wiki/Human%E2%80%93computer_interaction">https://en.wikipedia.org/wiki/Human%E2%80%93computer_interaction</a>

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	2	-	1	2	1	2
CO 2	2	1	2	1	3	1
CO 3	3	2	1	1	-	1
CO 4	2	-	3	2	1	3
CO 5	2	3	-	2	3	2
<b>Weightage of course contributed to each PSO</b>	11	6	7	8	8	9

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

Subject	Subject Name	U	A	T	L	T	P	S			Marks
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Code		Category					Credits	Inst. Hours	CIA	External	Total
	<b>Fuzzy Logic</b>	Elective	Y	-	-	-	3	5	25	75	100
<b>Course Objective</b>											
LO1	To understand the basic concept of Fuzzy logic										
LO2	To learn the various operations on relation properties										
LO3	To study about the membership functions										
LO4	To learn about the Defuzzification and Fuzzy Rule-Based System										
LO5	To learn the concepts of Applications of Fuzzy Logic										
UNIT	Details						No. of Hours	Course Objective			
I	Introduction to Fuzzy Logic- Fuzzy Sets- Fuzzy Set Operations, Properties of Fuzzy Sets, Classical and Fuzzy Relations: Introduction-Cartesian Product of Relation-Classical Relations-Cardinality of Crisp Relation.						15	C1			
II	Operations on Crisp Relation-Properties of Crisp Relations-Composition Fuzzy Relations, Cardinality of Fuzzy Relations-Operations on Fuzzy Relations-Properties of Fuzzy Relations-Fuzzy Cartesian Product and Composition-Tolerance and Equivalence Relations ,Crisp Relation.						15	C2			
III	Membership Functions: Introduction, Features of Membership Function, Classification of Fuzzy Sets, Fuzzification, Membership Value Assignments, Intuition, Inference, Rank Ordering.						15	C3			
IV	Defuzzification: Introduction, Lambda Cuts for Fuzzy Sets, Lambda Cuts for Fuzzy Relations, Defuzzification Methods, Fuzzy Rule-Based System: Introduction,						15	C4			

	Formation of Rules, Decomposition of Rules, Aggregation of Fuzzy Rules, Properties of Set of Rules.		
V	Applications of Fuzzy Logic: Fuzzy Logic in Automotive Applications, Fuzzy Antilock Brake System-Antilock-Braking System and Vehicle Speed-Estimation Using Fuzzy Logic.	15	C5
<b>Total</b>			
<b>Course Outcomes</b>		<b>Programme Outcomes</b>	
CO	On completion of this course, students will		
1	Understand the basics of Fuzzy sets, operation and properties.	PO1	
2	Apply Cartesian product and composition on Fuzzy relations and use the tolerance and Equivalence relations.	PO1, PO2	
3	Analyze various fuzzification methods and features of membership Functions.	PO4, PO6	
4	Evaluate defuzzification methods for real time applications.	PO4, PO5, PO6	
5	Design an application using Fuzzy logic and its Relations.	PO3, PO8	
<b>Text Book</b>			
1	S. N. Sivanandam, S. Sumathi and S. N. Deepa-Introduction to Fuzzy Logic using MATLAB, Springer-Verlag Berlin Heidelberg 2007.		
<b>Reference Books</b>			
1.	Guanrong Chen and Trung Tat Pham- Introduction to Fuzzy Sets, Fuzzy Logic and Fuzzy Control Systems		
2.	Timothy J Ross , Fuzzy Logic with Engineering Applications		
<b>Web Resources</b>			
1.	<a href="https://www.javatpoint.com/fuzzy-logic">https://www.javatpoint.com/fuzzy-logic</a>		
2.	<a href="https://www.guru99.com/what-is-fuzzy-logic.html">https://www.guru99.com/what-is-fuzzy-logic.html</a>		

**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	3	2	2	2	3
CO 4	2	3	1	1	3	3
CO 5	3	2	3	3	3	3
<b>Weightage of course contributed to each PSO</b>	13	13	11	10	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
	<b>Artificial Intelligence</b>	Elective	-	Y	-	-	3	5	25	75	100
<b>Course Objective</b>											
LO1	To learn various concepts of AI Techniques.										
LO2	To learn various Search Algorithm in AI.										
LO3	To learn probabilistic reasoning and models in AI.										
LO4	To learn about Markov Decision Process.										
LO5	To learn various type of Reinforcement learning.										
<b>UNIT</b>	<b>Details</b>									<b>No. of Hours</b>	

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	15
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	15
III	Probabilistic Reasoning : Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference, temporal model, hidden Markov model.	15
IV	Markov Decision process : MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable MDPs.	15
V	Reinforcement Learning : Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning	15
<b>Total</b>		<b>75</b>
<b>Course Outcomes</b>		<b>Programme Outcome</b>
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, PO8
<b>Text Book</b>		
1	Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach” , 3rd Edition, Prentice Hall.	
	Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill	
<b>Reference Books</b>		
1.	Trivedi, M.C., “A Classical Approach to Artificial Intelligence”, Khanna Publishing House, Delhi.	
2.	Saroj Kaushik, “Artificial Intelligence”, Cengage Learning India, 2011	

3.	David Poole and Alan Mackworth, “Artificial Intelligence: Foundations for Computational Agents”, Cambridge University Press 2010
<b>Web Resources</b>	
1.	NPTEL&MOOCcoursestitledArtificialIntelligenceandExpertSystems
2.	<a href="https://nptel.ac.in/courses/106106140/">https://nptel.ac.in/courses/106106140/</a>
3.	<a href="https://nptel.ac.in/courses/106106126/">https://nptel.ac.in/courses/106106126/</a>

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	2	3	2	3	2	-
CO 2	2	-	2	3	3	2
CO 3	1	2	-	-	2	3
CO 4	3	1	2	2	2	1
CO 5	2	1	3	1	2	2
<b>Weightage of course contributed to each PSO</b>	10	7	9	9	11	8

**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
	<b>Mobile Ad-hoc Network</b>	Elective	-	Y	-	-	3	5	25	75	100
<b>Course Objective</b>											
LO1	To learn about basics concepts of Ad-hoc network models.										
LO2	To learn about Medium Access Protocols(MAC).										
LO3	To learn about Network Routing Protocols and Algorithms .										
LO4	To learn about Delivery and Security in Transport Layer .										
LO5	To learn about cross layer design and optimization techniques, Integration of ad-hoc										

	with Mobile IP networks.	
UNIT	Details	No. of Hours
I	<b>Introduction:</b> Introduction to ad-hoc networks – definition, characteristics features, applications. Characteristics of wireless channel, ad-hoc mobility models indoor and out-door models.	15
II	<b>Medium Access Protocol:</b> <ul style="list-style-type: none"> <li>• MAC Protocols: Design issues, goals and classification.</li> <li>• Contention based protocols – with reservation, scheduling algorithms, protocols using directional antennas.</li> <li>• IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.</li> </ul>	15
III	<b>Network Protocols :</b> Routing Protocols: Design issues, goals and classification. Proactive Vs reactive routing, unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, energy aware routing algorithm, hierarchical routing, QoS aware routing.	15
IV	<b>End – end delivery and security:</b> Transport Layer: Issues in designing – Transport layer classification, ad-hoc transport protocols. Security issues in ad-hoc networks: issues and challenges, network security attacks, secure routing protocols.	15
V	Need for cross layer design, cross layer optimization, parameter optimization techniques, cross layer cautionary perspective. Integration of ad-hoc with Mobile IP networks.	15
	<b>Total</b>	<b>75</b>
Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
1	Understand the basics concepts of Ad-hoc network models.	PO1
2	Understand the Medium Access Protocols(MAC).	PO1, PO2
3	Understand Network Routing Protocols, design issues and various types of Routing Algorithms .	PO4, PO6

4	Understand the concepts of Delivery and Security in Transport Layer .	PO4, PO5, PO6
5	Understand cross layer techniques and Integration of ad-hoc with Mobile IP networks.	PO3, PO8
<b>Text Book</b>		
1	C. Siva Ram Murthy and B. S. Manoj, Ad hoc Wireless Networks Architecture and Protocols II edition, Pearson Edition, 2007.	
	Charles E. Perkins, Ad hoc Networking, Addison – Wesley, 2000	
<b>Reference Books</b>		
1.	Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, Mobile ad-hoc networking, Wiley-IEEE press, 2004.	
2.	Mohammad Ilyas, The handbook of ad-hoc wireless networks, CRC press, 2002.	
3.	T. Camp, J. Boleng, and V. Davies “A Survey of Mobility Models for Ad-hoc Network”	
4.	Research, “Wireless Commn. and Mobile Comp - Special Issue on Mobile Ad-hoc networking Research, Trends and Applications”, Vol. 2, no. 5, 2002, pp. 483 – 502.	
5.	A survey of integrating IP mobility protocols and Mobile Ad-hoc networks, FekriM. bduljalil and Shrikant K. Bodhe, IEEE communication Survey and tutorials, no:12007.	
<b>Web Resources</b>		
1.	<a href="https://en.wikipedia.org/wiki/Wireless_ad_hoc_network">https://en.wikipedia.org/wiki/Wireless_ad_hoc_network</a>	
2.	<a href="https://www.ijert.org/mobile-ad-hoc-network">https://www.ijert.org/mobile-ad-hoc-network</a>	
3.	<a href="https://books.google.com/books/about/Mobile_Ad_Hoc_Networking.htmlid=GnkcHEsxAigC">https://books.google.com/books/about/Mobile_Ad_Hoc_Networking.htmlid=GnkcHEsxAigC</a>	

**Mapping with Programme Outcomes:**

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

<b>Weightage of course contributed to each PSO</b>	12	10	5	14	14	7
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**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
	<b>Computatiional Intelligence</b>	Elective	Y	-	-	-	3	5	25	75	100
<b>Course Objective</b>											
LO1	To identify and understand the basics of AI and its search.										
LO2	To study about the Fuzzy logic systems.										
LO3	Understand and apply the concepts of Neural Network and its functions.										
LO4	Understand the concepts of Artificial Neural Network										
LO5	To study about the Genetic Algorithm.										
UNIT	Details						No. of Hours	Course Objective			
I	<b>Introduction to AI:</b> Problem formulation – AI Applications – Problems – State Space and Search – Production Systems – Breadth First and Depth First – Travelling Salesman Problem – Heuristic search techniques: Generate and Test – Types of Hill Climbing.						15	C1			
II	<b>Fuzzy Logic Systems:</b> Notion of fuzziness – Operations on fuzzy sets – T-norms and other aggregation operators – Basics of Approximate Reasoning – Compositional Rule of Inference – Fuzzy Rule Based Systems – Schemes of Fuzzification – Inferencing – Defuzzification – Fuzzy Clustering – fuzzy rule-based classifier.						15	C2			
III	<b>Neural Networks:</b> What is Neural Network, Learning						15	C3			

	rules and various activation functions, Single layer Perceptions, Back Propagation networks, Architecture of Backpropagation (BP) Networks, Back propagation Learning, Variation of Standard Back propagation Neural Network, Introduction to Associative Memory, Adaptive Resonance theory and Self Organizing Map, Recent Applications		
IV	<b>Artificial Neural Networks:</b> Fundamental Concepts – Basic Models of Artificial Neural Networks – Important Terminologies of ANNs – McCulloch-Pitts Neuron – Linear Separability – Hebb Network.	15	C4
V	<b>Genetic Algorithm:</b> Introduction – Biological Background – Genetic Algorithm Vs Traditional Algorithm – Basic Terminologies in Genetic Algorithm – Simple GA – General Genetic Algorithm – Operators in Genetic Algorithm	15	C5
<b>Total</b>		<b>75</b>	
<b>Course Outcomes</b>		<b>Programme Outcomes</b>	
CO	On completion of this course, students will		
1	Describe the fundamentals of artificial intelligence concepts and searching techniques.	PO1	
2	Develop the fuzzy logic sets and membership function and defuzzification techniques.	PO1, PO2	
3	Understand the concepts of Neural Network and analyze and apply the learning techniques	PO4, PO6	
4	Understand the artificial neural networks and its applications.	PO4, PO5, PO6	
5	Understand the concept of Genetic Algorithm and Analyze the optimization problems using GAs.	PO3, PO8	
<b>Text Book</b>			
1	S.N. Sivanandam and S.N. Deepa, “Principles of Soft Computing”, 2nd Edition, Wiley India Pvt. Ltd.		
2	Stuart Russell and Peter Norvig, “Artificial Intelligence - A Modern Approach”, 2nd Edition, Pearson Education in Asia.		
3	S. Rajasekaran, G. A. Vijayalakshmi, “Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications”, PHI.		

Reference Books	
1.	F. Martin, Mc neill, and Ellen Thro, "Fuzzy Logic: A Practical approach", AP Professional, 2000. Chin Teng Lin, C. S. George Lee," Neuro-Fuzzy Systems", PHI
2.	Chin Teng Lin, C. S. George Lee," Neuro-Fuzzy Systems", PHI.
Web Resources	
1.	<a href="https://www.javatpoint.com/artificial-intelligence-tutorial">https://www.javatpoint.com/artificial-intelligence-tutorial</a>
2.	<a href="https://www.w3schools.com/ai/">https://www.w3schools.com/ai/</a>

**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
CO 2	3	2	3	2	3	3
CO 3	3	1	2	2	2	3
CO 4	2	3	-	1	3	-
CO 5	3	2	3	3	3	3
<b>Weightage of course contributed to each PSO</b>	13	11	10	10	11	10

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
	<b>Grid Computing</b>	Elective	-	Y	-	-	4	4	25	75	100
Course Objective											
LO1	To learn the basic construction and application of Grid computing.										
LO2	To learn grid computing organization and their Role.										
LO3	To learn Grid Computing Anatomy.										
LO4	To learn Grid Computing road map.										
LO5	To learn various type of Grid Architecture.										
UNIT	Details										No. of Hours
I	Introduction: Early Grid Activity, Current Grid Activity, Overview of Grid Business areas, Grid Applications, Grid Infrastructures.										15

II	Grid Computing organization and their Roles: Organizations Developing Grid Standards, and Best Practice Guidelines, Global Grid Forum (GCF), #Organization Developing Grid Computing Toolkits and Framework#, Organization and building and using grid based solutions to solve computing, commercial organization building and Grid Based solutions.	15
III	Grid Computing Anatomy: The Grid Problem, The conceptual of virtual organizations, # Grid Architecture # and relationship to other distributed technology.	15
IV	The Grid Computing Road Map: Autonomic computing, Business on demand and infrastructure virtualization, Service-Oriented Architecture and Grid, #Semantic Grids#.	15
V	Merging the Grid services Architecture with the Web Services Architecture: Service-Oriented Architecture, Web Service Architecture, #XML messages and Enveloping#, Service message description Mechanisms, Relationship between Web Services and Grid Services, Web services Interoperability and the role of the WS-I Organization.	15
<b>Total</b>		<b>75</b>
<b>Course Outcomes</b>		<b>Programme Outcome</b>
CO	On completion of this course, students will	
1	To understand the basic elements and concepts of Grid computing.	PO1
2	To understand the Grid computing toolkits and Framework.	PO1, PO2
3	To understand the concepts of Anatomy of Grid Computing.	PO4, PO6
4	To understand the concept of service oriented architecture.	PO4, PO5, PO6
5	To Gain knowledge on grid and web service architecture.	PO3, PO8
<b>Text Book</b>		
1	Joshy Joseph and Craig Fellenstein, Grid computing, Pearson / IBM Press, PTR, 2004.	
<b>Reference Books</b>		
1.	1. Ahmer Abbas and Graig computing, A Practical Guide to technology and applications, Charles River Media, 2003.	
<b>Web Resources</b>		
1.	<a href="https://en.wikipedia.org/wiki/Grid_computing">https://en.wikipedia.org/wiki/Grid_computing</a>	
2.	<a href="https://link.springer.com/chapter/10.1007/978-1-84882-409-6_4">https://link.springer.com/chapter/10.1007/978-1-84882-409-6_4</a>	

3.	<a href="https://www.redbooks.ibm.com/redbooks/pdfs/sg246778.pdf">https://www.redbooks.ibm.com/redbooks/pdfs/sg246778.pdf</a>
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**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	2	3	1	2	1	2
CO 2	2	1	2	1	3	1
CO 3	3	2	1	1	-	1
CO 4	3	-	3	2	1	3
CO 5	2	3	1	2	3	2
<b>Weightage of course contributed to each PSO</b>	12	9	8	8	8	9

**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
	<b>Cloud Computing</b>	Elective	-	Y	-	-	4	4	25	75	100
<b>Course Objective</b>											
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	Details										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.										15

	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.	
II	<p>Cloud Services</p> <p>Compute Services: Amazon Elastic Computer Cloud - Google Compute Engine - Windows Azure Virtual Machines</p> <p>Storage Services: Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage</p> <p>Database Services: Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database - Windows Azure Table Service</p> <p>Application Services: Application Runtimes and Frameworks - Queuing Services - Email Services - Notification Services - Media Services</p> <p>Content Delivery Services: Amazon CloudFront - Windows Azure Content Delivery Network</p> <p>Analytics Services: Amazon Elastic MapReduce - Google MapReduce Service - Google BigQuery - Windows Azure HDInsight</p> <p>Deployment and Management Services: Amazon Elastic Beanstack - Amazon CloudFormation</p> <p>Identity and Access Management Services: Amazon Identity and Access Management - Windows Azure Active Directory</p> <p>Open Source Private Cloud Software: CloudStack – Eucalyptus - OpenStack</p>	15
III	<p><b>Cloud Application Design:</b> 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: Relational Approach (SQL), Non-Relational Approach (NoSQL).</p>	15
IV	<p><b>Cloud Application Benchmarking and Tuning:</b> Introduction to Benchmarking – Steps in Benchmarking – Workload Characteristics – Application Performance Metrics – Design Consideration for Benchmarking Methodology – Benchmarking Tools and Types of Tests – Deployment Prototyping.</p> <p><b>Cloud Security:</b> Introduction – CSA Cloud Security Architecture – Authentication (SSO) – Authorization – Identity and Access Management – Data Security : Securing data at rest, securing data in</p>	15

	motion – Key Management – Auditing.	
V	<b>Case Studies:</b> Cloud Computing for Healthcare – Cloud Computing for Energy Systems - Cloud Computing for Transportation Systems - Cloud Computing for Manufacturing Industry - Cloud Computing for Education.	15
<b>Total</b>		<b>75</b>
<b>Course Outcomes</b>		<b>Programme Outcome</b>
CO	On completion of this course, students will	
1	Understand the fundamental concepts and Technologies in Cloud Computing.	PO1
2	Able to understand various cloud service types and their uses and pitfalls.	PO1, PO2
3	Able to understand Cloud Architecture and Application design.	PO4, PO6
4	Understand the various aspects of application design, benchmarking and security in the Cloud.	PO4, PO5, PO6
5	Understand various Case Studies in Cloud Computing.	PO3, PO8
<b>Text Book</b>		
1	ArshdeepBahga, Vijay Madiseti, <i>Cloud Computing – A Hands On Approach</i> , Universities Press (India) Pvt. Ltd., 2018	
<b>Reference Books</b>		
1.	Anthony T Velte, Toby J Velte, Robert Elsenpeter, <i>Cloud Computing: A Practical Approach</i> , Tata McGraw-Hill, 2013.	
2.	Barrie Sosinsky, <i>Cloud Computing Bible</i> , Wiley India Pvt. Ltd., 2013.	
3.	David Crookes, <i>Cloud Computing in Easy Steps</i> , Tata McGraw Hill, 2015.	
4.	Dr. Kumar Saurabh, <i>Cloud Computing</i> , Wiley India, Second Edition 2012.	
<b>Web Resources</b>		
1.	<a href="https://en.wikipedia.org/wiki/Cloud_computing">https://en.wikipedia.org/wiki/Cloud_computing</a>	
2.	<a href="https://link.springer.com/chapter/10.1007/978-3-030-34957-8_7">https://link.springer.com/chapter/10.1007/978-3-030-34957-8_7</a>	

3.	<a href="https://webobjects.cdw.com/webobjects/media/pdf/solutions/cloud-computing/121838-CDW-Cloud-Computing-Reference-Guide.pdf">https://webobjects.cdw.com/webobjects/media/pdf/solutions/cloud-computing/121838-CDW-Cloud-Computing-Reference-Guide.pdf</a>
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**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	2	2	2	3	3	1
CO 2	3	1	2	3	3	-
CO 3	3	2	1	2	1	3
CO 4	3	3	2	3	2	-
CO 5	2	2	1	3	3	3
<b>Weightage of course contributed to each PSO</b>	13	10	8	14	12	7

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
	<b>Artificial Neural Networks</b>		-	Y	-	-	3	5	25	75	100
<b>Course Objective</b>											
LO1	<b>Understand the basics of artificial neural networks, learning process, single layer and multi-layer perceptron networks.</b>										
LO2	Understand the Error Correction and various learning algorithms and tasks.										
LO3	Identify the various Single Layer Perception Learning Algorithm.										
LO4	Identify the various Multi-Layer Perception Network.										
LO5	Analyze the Deep Learning of various Neural network and its Applications.										
UNIT	Details										No. of Hours
I	Artificial Neural Model- Activation functions- Feed forward and Feedback, Convex Sets, Convex Hull and Linear Separability, Non-Linear Separable Problem - Multilayer Networks. Learning Algorithms-										15

	Error correction - Gradient Descent Rules, Perception Learning Algorithm, Perception Convergence Theorem.	
II	Introduction, Error correction learning, Memory-based learning, Hebbian learning, Competitive learning, Boltzmann learning, credit assignment problem, Learning with and without teacher, learning tasks, Memory and Adaptation.	15
III	.Single layer Perception: Introduction, Pattern Recognition, Linear classifier, Simple perception, Perception learning algorithm, Modified Perception learning algorithm, Adaptive linear combiner, Continuous perception, Learning in continuous perception. Limitation of Perception.	15
IV	Multi-Layer Perception Networks: Introduction, MLP with 2 hidden layers, Simple layer of a MLP, Delta learning rule of the output layer, Multilayer feed forward neural network with continuous perceptions, Generalized delta learning rule, Back propagation algorithm	15
V	Deep learning- Introduction- Neuro architectures building blocks for the DL techniques, Deep Learning and Neocognitron, Deep Convolutional Neural Networks, Recurrent Neural Networks (RNN), feature extraction, Deep Belief Networks, Restricted Boltzman Machines, Training of DNN and Applications	15
<b>Total</b>		<b>75</b>
<b>Course Outcomes</b>		<b>Programme Outcome</b>
CO	On completion of this course, students will	
1	<b>Students will learn the basics of artificial neural networks with single layer and multi-layer perception networks.</b>	PO1
2	Learn about the Error Correction and various learning algorithms and tasks.	PO1, PO2
3	Learn the various Perception Learning Algorithm.	PO4, PO6
4	Learn about the various Multi-Layer Perception Network.	PO4, PO5, PO6
5	Understand the Deep Learning of various Neural network and its Applications.	PO3, PO8
<b>Text Book</b>		

1	Neural Networks A Classroom Approach- Satish Kumar, McGraw Hill- Second Edition.
2.	“Neural Network- A Comprehensive Foundation”- Simon Haykins, Pearson Prentice Hall, 2nd Edition, 1999.
<b>Reference Books</b>	
1.	Artificial Neural Networks-B. Yegnanarayana, PHI, New Delhi 1998.
<b>Web Resources</b>	
1.	<a href="https://www.w3schools.com/ai/ai_neural_networks.asp">https://www.w3schools.com/ai/ai_neural_networks.asp</a>
2.	<a href="https://en.wikipedia.org/wiki/Artificial_neural_network">https://en.wikipedia.org/wiki/Artificial_neural_network</a>
3.	<a href="https://link.springer.com/chapter/10.1007/978-3-642-21004-4_12">https://link.springer.com/chapter/10.1007/978-3-642-21004-4_12</a>

**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
CO 2	3	2	3	2	3	3
CO 3	3	1	2	2	2	3
CO 4	2	3	3	1	3	1
CO 5	3	3	3	3	3	3
<b>Weightage of course contributed to each PSO</b>	13	12	13	10	11	11

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

Subject	Subject Name	U	a	r	L	T	P	S			Marks
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Code		Category					Credits	Inst. Hours	CIA	External	Total
	<b>Agile Project Management</b>	Elective	-	Y	-	-	3	5	25	75	100
<b>Course Objective</b>											
LO1	Learning of software design, software technologies and APIs.										
LO2	Detailed demonstration about Agile development and testing techniques.										
LO3	Learning about Agile Planning and Execution.										
LO4	ing of Agile Management Design and Quality Check.										
LO5	Detailed examination of Agile development and testing techniques.										
UNIT	Details										No. of Hours
I	<p><b>Introduction:Modernizing Project Management:</b> Project Management Needed a Makeover – Introducing Agile Project Management.</p> <p><b>Applying the Agile Manifesto and Principles:</b> Understanding the Agile manifesto – Outlining the four values of the Agile manifesto – Defining the 15 Agile Principles – Adding the Platinum Principles – Changes as a result of Agile Values – The Agile litmus test.</p> <p><b>Why Being Agile Works Better:</b> Evaluating Agile benefits – How Agile approaches beat historical approaches – Why people like being Agile.</p>										15
II	<p><b>Being Agile</b></p> <p><b>Agile Approaches:</b> Diving under the umbrella of Agile approaches – Reviewing the Big Three: Lean, Scrum, Extreme Programming - Summary</p> <p><b>Agile Environments in Action:</b> Creating the physical environment – Low-tech communicating – High-tech communicating – Choosing tools.</p>										15

	<p><b>Agile Behaviours in Action:</b> Establishing Agile roles – Establishing new values – Changing team philosophy.</p>	
III	<p><b>Agile Planning and Execution</b></p> <p><b>Defining the Product Vision and Roadmap:</b> Agile planning – Defining the product vision – Creating a product roadmap – Completing the product backlog.</p> <p><b>Planning Releases and Sprints:</b> Refining requirements and estimates – Release planning – Sprint planning.</p> <p><b>Working Throughout the Day:</b> Planning your day – Tracking progress – Agile roles in the sprint – Creating shippable functionality – The end of the day.</p> <p><b>Showcasing Work, Inspecting and Adapting:</b> The sprint review – The sprint retrospective.</p> <p><b>Preparing for Release:</b> Preparing the product for deployment (the release sprint) – Preparing the operational support – Preparing the organization for product deployment - Preparing the marketplace for product deployment</p>	15
IV	<p><b>Agile Management</b></p> <p><b>Managing Scope and Procurement:</b> What’s different about Agile scope management – Managing Agile scope – What’s different about Agile procurement – Managing Agile procurement.</p> <p><b>Managing Time and Cost:</b> What’s different about Agile time management – Managing Agile schedules – What’s different about Agile cost management – Managing Agile budgets.</p> <p><b>Managing Team Dynamics and Communication:</b> What’s different about Agile team dynamics – Managing Agile team dynamics – What’s different about Agile communication – Managing Agile communication.</p> <p><b>Managing Quality and Risk:</b> What’s different about Agile quality – Managing Agile quality – What’s different about Agile risk management</p>	15

	– Managing Agile risk.	
V	<p><b>Implementing Agile</b></p> <p><b>Building a Foundation:</b> Organizational and individual commitment – Choosing the right pilot team members – Creating an environment that enables Agility – Support Agility initially and over time.</p> <p><b>Being a Change Agent:</b> Becoming Agile requires change – why change doesn't happen on its own – Platinum Edge's Change Roadmap – Avoiding pitfalls – Signs your changes are slipping.</p> <p><b>Benefits, Factors for Success and Metrics:</b> Ten key benefits of Agile project management – Ten key factors for project success – Ten metrics for Agile Organizations.</p>	15
	<b>Total</b>	<b>75</b>
<b>Course Outcomes</b>		<b>Programme Outcome</b>
CO	On completion of this course, students will	
1	Understanding of software design, software technologies and APIs using Agile Management.	PO1
2	Understanding of Agile development and testing techniques.	PO1, PO2
3	Understanding about Agile Planning and Execution using Sprint.	PO4, PO6
4	Understanding of Agile Management Design, scope, Procurement, managing Time and Cost and Quality Check.	PO4, PO5, PO6
5	Analysing of Agile development and testing techniques.	PO3, PO8
<b>Text Book</b>		
1	Mark C. Layton, Steven J. Ostermiller, Agile Project Management for Dummies, 2nd Edition, Wiley India Pvt. Ltd., 2018.	
	Jeff Sutherland, Scrum – The Art of Doing Twice the Work in Half the Time, Penguin,	

	2014.
<b>Reference Books</b>	
1.	<b>Mark C. Layton, David Morrow, <i>Scrum for Dummies</i>, 2<sup>nd</sup> Edition, Wiley India Pvt. Ltd., 2018.</b>
2.	<b>Mike Cohn, <i>Succeeding with Agile – Software Development using Scrum</i>, Addison-Wesley Signature Series, 2010.</b>
3.	Alex Moore, <i>Agile Project Management</i> , 2020.
4.	Alex Moore, <i>Scrum</i> , 2020.
5.	Andrew Stellman and Jennifer Greene, <i>Learning Agile: Understanding Scrum, XP, Lean, and Kanban</i> , Shroff/O'Reilly, First Edition, 2014.
<b>Web Resources</b>	
1.	<a href="http://www.agilealliance.org/resources">www.agilealliance.org/resources</a>

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	2	3	1	2	1	2
CO 2	3	1	2	1	3	1
CO 3	3	2	1	1	3	1
CO 4	3	2	3	2	1	3
CO 5	2	3	1	2	3	2
<b>Weightage of course contributed to each PSO</b>	13	11	8	8	11	9

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

**Annexure II****Skill Enhancement Course (SEC1 – SEC 8)**

1. Fundamentals of Information Technology
2. Introduction to HTML
3. Web Designing
4. PHP Programming
5. Software Testing
6. Problem Solving Techniques
7. Understanding Internet
8. Office Automation

9. Quantitative Aptitude
10. Open Source Technologies
11. Multimedia Systems
12. Advanced Excel
13. Biometrics
14. Cyber Forensics
15. Pattern Recognition
16. Enterprise Resource Planning
17. Robotics and Applications
18. Simulation and Modelling
19. Organization Behavior and more..

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	<b>FUNDAMENTALS OF INFORMATION TECHNOLOGY</b>	Specific Elective	2	-	-	I	2	25	75	100
<b>Learning Objectives</b>										
<b>LO1</b>	Understand basic concepts and terminology of information technology.									
<b>LO2</b>	Have a basic understanding of personal computers and their operation									
<b>LO3</b>	Be able to identify data storage and its usage									
<b>LO4</b>	Get great knowledge of software and its functionalities									
<b>LO5</b>	Understand about operating system and their uses									
<b>UNIT</b>	<b>Contents</b>								<b>No. Of. Hours</b>	
I	<b>Introduction to Computers</b> - Generations of Computer – Data and Information – Components of Computer – Software – Hardware – Input Devices - Output Devices — Types of Operating System.								<b>6</b>	
II	<b>MS Word:</b> Introduction – Elements of Window – Files, Folders and Directories – Text Manipulating: Cut, Copy, Paste, Drag and Drop – Text Formatting: Font – Style, Size, Face and Colors (Both foreground and background) – Alignment - Bullets and Numbering - Header and footer- watermark – inserting objects (images, other application document) – Table creation – Mail merge.								<b>6</b>	
III	<b>Ms Excel:</b> 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.								<b>6</b>	
IV	<b>MS PowerPoint:</b> 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).								<b>6</b>	
V	<b>Internet:</b> 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. <b>E-Commerce:</b> Digital Signature – Digital Currency – Online shopping and transaction.	<b>6</b>
<b>TOTAL HOURS</b>		<b>30</b>
<b>Course Outcomes</b>		<b>Programme Outcomes</b>
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, PO6
<b>Textbooks</b>		
1	Anoop Mathew, S. Kavitha Murugesan (2009), “ Fundamental of Information Technology”, Majestic Books.	
2	Alexis Leon, Mathews Leon,” Fundamental of Information Technology”, 2 <sup>nd</sup> Edition.	
3	S. K Bansal, “Fundamental of Information Technology”.	
<b>Reference Books</b>		
1.	Bhardwaj Sushil Puneet Kumar, “Fundamental of Information Technology”	
2.	GG WILKINSON, “Fundamentals of Information Technology”, Wiley-Blackwell	
3.	A Ravichandran , “Fundamentals of Information Technology”, Khanna Book Publishing	
<b>Web Resources</b>		
1.	<a href="https://testbook.com/learn/computer-fundamentals">https://testbook.com/learn/computer-fundamentals</a>	
2.	<a href="https://www.tutorialsmate.com/2020/04/computer-fundamentals-tutorial.html">https://www.tutorialsmate.com/2020/04/computer-fundamentals-tutorial.html</a>	
3.	<a href="https://www.javatpoint.com/computer-fundamentals-tutorial">https://www.javatpoint.com/computer-fundamentals-tutorial</a>	
4.	<a href="https://www.tutorialspoint.com/computer_fundamentals/index.htm">https://www.tutorialspoint.com/computer_fundamentals/index.htm</a>	
5.	<a href="https://www.nios.ac.in/media/documents/sec229new/Lesson1.pdf">https://www.nios.ac.in/media/documents/sec229new/Lesson1.pdf</a>	

**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
<b>Weightage of course contributed to each PSO</b>	<b>13</b>	<b>13</b>	<b>13</b>	<b>12</b>	<b>12</b>	<b>10</b>

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	Exter	Total
	<b>INTRODUCTION TO HTML</b>	Specific Elective	2	-	-		2	25	75	100
<b>Learning Objectives</b>										
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.									
<b>UNIT</b>	<b>Contents</b>									<b>No. Of. Hours</b>
I	<b>Introduction :WebBasics: WhatisInternet–Webbrowsers–WhatisWebpage – HTMLBasics:Understandingtags.</b>									<b>6</b>

II	<b>TagsforDocumentstructure(HTML,Head,BodyTag).Blockleveltextelements: Headingsparagraph(&lt;p&gt; tag)–Fontstyleelements: (bold,italic,font,small,strong,strike,bigtags)</b>	<b>6</b>
III	<b>Lists:Typesoflists:Ordered,Unordered– NestingLists– Othertags:Marquee,HR,BR-UsingImages –CreatingHyperlinks.</b>	<b>6</b>
IV	<b>Tables:CreatingbasicTable,Tableelements,Caption– Tableandcellalignment–Rowspan,Colspan–Cellpadding.</b>	<b>6</b>
V	<b>Frames:Frameset–TargetedLinks–Noframe–Forms:Input, Textarea,Select,Option.</b>	<b>6</b>
<b>TOTAL HOURS</b>		<b>30</b>
<b>Course Outcomes</b>		<b>Programme Outcomes</b>
CO	On completion of this course, students will	
CO 1	Knows the basic concept in HTML Concept of resources in HTML	PO1, PO2, PO3, PO4, PO5, PO6
CO 2	<b>Knows Design concept. Concept of Meta Data Understand the concept of save the files.</b>	PO1, PO2, PO3, PO4, PO5, PO6
CO 3	Understand the page formatting. Concept of list	PO1, PO2, PO3, PO4, PO5, PO6
CO 4	Creating Links. Know the concept of creating link to email address	PO1, PO2, PO3, PO4, PO5, PO6
CO 5	Concept of adding images Understand the table creation.	PO1, PO2, PO3, PO4, PO5, PO6
<b>Textbooks</b>		
1	“Mastering HTML5 and CSS3 Made Easy”, TeachUComp Inc., 2014.	
2	<b>Thomas Michaud, “Foundations of Web Design: Introduction to HTML &amp; CSS”</b>	
<b>Web Resources</b>		
1	<a href="https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf">https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf</a>	
2	<a href="https://www.w3schools.com/html/default.asp">https://www.w3schools.com/html/default.asp</a>	

**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

<b>CO 4</b>	3	3	3	3	3	3
<b>CO 5</b>	3	3	3	2	3	3
<b>Weightage of course contributed to each PSO</b>	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	Inst.	Marks		
									CIA	External	Total
	<b>WEB DESIGNING</b>	Specific Elective	Y	-	-	-	2	2	25	75	100
<b>Course Objective</b>											
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		Course Objective		
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		C1		
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		C2		

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	C3
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	C4
V	Advance script, JavaScript and objects, JavaScript own objects, the DOM and web browser environments, forms and validations.	6	C5
<b>Total</b>		<b>60</b>	
<b>Course Outcomes</b>		<b>Programme Outcome</b>	
CO	On completion of this course, students will		
1	Develop working knowledge of HTML	PO1, PO3, PO6, PO8	
2	Ability to Develop and publish Web pages using Hypertext Markup Language (HTML).	PO1,PO2,PO3,PO6	
3	Ability to optimize page styles and layout with Cascading Style Sheets (CSS).	PO3, PO5	
4	Ability to develop a java script	PO1, PO2, PO3, PO7	
5	An ability to develop web application using Ajax.	PO2, PO6, PO7	
<b>Text Book</b>			
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.		
<b>Reference Books</b>			
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.		
<b>Web Resources</b>			
1.	NPTEL & MOOC courses titled Web Design and Development.		

2.	<a href="https://www.geeksforgeeks.org">https://www.geeksforgeeks.org</a>
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**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	-	2	1	1
CO 2	3	3	-	2	-	1
CO 3	3	3	-	2	2	1
CO 4	3	3	-	2	-	1
CO 5	3	3	3	2	-	1
<b>Weightage of course contributed to each PSO</b>	15	15	3	10	3	4

**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
	<b>PHP PROGRAMMING</b>	Specific Elective	Y				2	2	25	75	100
<b>Course Objective</b>											
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	Details								No. of Hours	Course Objectives	
I	Introduction to PHP -Basic Knowledge of websites -Introduction of Dynamic Website -Introduction to PHP -Scope of PHP - XAMPP and WAMP Installation								6	CO1	
II	PHP Programming Basics -Syntax of PHP -Embedding PHP in HTML -Embedding HTML in PHP.								6	CO2	

	Introduction to PHP Variable -Understanding Data Types -Using Operators -Using Conditional Statements -If(), else if() and else if condition Statement.		
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	CO3
IV	PHP Advanced Concepts -Reading and Writing Files -Reading Data from a File.	6	CO4
V	Managing Sessions and Using Session Variables -Destroying a Session -Storing Data in Cookies -Setting Cookies.	6	CO5
<b>Total</b>		<b>30</b>	
<b>Course Outcomes</b>		<b>Programme Outcomes</b>	
CO	On completion of this course, students will		
1	Write PHP scripts to handle HTML forms	PO1,PO4,PO6,PO8.	
2	Write regular expressions including modifiers, operators, and metacharacters.	PO2,PO5,PO7.	
3	Create PHP Program using the concept of array.	PO3,PO6,PO8.	
4	Create PHP programs that use various PHP library functions	PO2,PO3,PO5,PO8.	
5	Manipulate files and directories.	PO3,PO5,PO6.	
<b>Text Book</b>			
1	<b>Head First PHP &amp; MySQL: A Brain-Friendly Guide- 2009-Lynn mighley and Michael Morrison.</b>		
2	<b>The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL- Alan Forbes</b>		
<b>Reference Books</b>			
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, 2 <sup>nd</sup> Edition.		
<b>Web Resources</b>			
1.	Refer MOOC Courses like NPTEL and SWAYAM		
2.	<a href="https://www.w3schools.com/php/default.asp">https://www.w3schools.com/php/default.asp</a>		

**Mapping with Programme Outcomes:**

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

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

**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
	<b>Software Testing</b>	Specific Elective	Y	-	-	-	2	2	25	75	100
<b>Course Objective</b>											
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	Details						No. of Hours	Course Objective			
<b>I</b>	Introduction: Purpose–Productivity and Quality in Software–TestingVsDebugging–Model for Testing–Bugs–Types of Bugs – Testing and Design Style.						6	C1			
<b>II</b>	Flow / Graphs and Path Testing – Achievable paths – Path instrumentation Application Transaction FlowTesting Techniques.						6	C2			
<b>III</b>	Data Flow Testing Strategies - Domain Testing:Domains and Paths – Domains and Interface Testing.						6	C3			
<b>IV</b>	Linguistic –Metrics – Structural Metric – Path Products and Path Expressions.SyntaxTesting–Formats–Test Cases						6	C4			

V	Logic Based Testing–Decision Tables–Transition Testing–States, State Graph, State Testing.	6	C5
<b>Total</b>		<b>30</b>	
<b>Course Outcomes</b>		<b>Program Outcomes</b>	
<b>CO</b>	On completion of this course, students will		
<b>1</b>	Students learn to apply software testing knowledge and engineering methods	PO1	
<b>2</b>	Have an ability to identify the needs of software test automation, and define and develop a test tool to support test automation.	PO1, PO2	
<b>3</b>	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	
<b>4</b>	Have basic understanding and knowledge of contemporary issues in software testing, such as component-based software testing problems	PO4, PO5, PO6	
<b>5</b>	Have an ability to use software testing methods and modern software testing tools for their testing projects.	PO3, PO8	
<b>Text Book</b>			
<b>1</b>	B.Beizer, “Software Testing Techniques”, IIEdn., Dream Tech India, New Delhi, 2003.		
<b>2</b>	K. V. K. Prasad, “Software Testing Tools”, Dream Tech. India, New Delhi, 2005		
<b>Reference Books</b>			
<b>1.</b>	I. Burnstein, 2003, “Practical Software Testing”, Springer International Edn.		
<b>2.</b>	E. Kit, 1995, “Software Testing in the Real World: Improving the Process”, Pearson Education, Delhi.		
<b>3.</b>	R. Rajani, and P. P. Oak, 2004, “Software Testing”, Tata Mcgraw Hill, New Delhi.		
<b>Web Resources</b>			
<b>1.</b>	<a href="https://www.javatpoint.com/software-testing-tutorial">https://www.javatpoint.com/software-testing-tutorial</a>		
<b>2.</b>	<a href="https://www.guru99.com/software-testing.html">https://www.guru99.com/software-testing.html</a>		

**Mapping with Programme Outcomes:**

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

<b>CO 2</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>
<b>CO 3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>
<b>CO 4</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>
<b>CO 5</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>
<b>Weightage of course contributed to each PSO</b>	11	10	12	11	11	8

**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
	<b>PROBLEM SOLVING TECHNIQUES</b>	Specific Elective	Y	-	-	-	2	2	25	75	100
<b>Course Objective</b>											
LO1	Understand the systematic approach to problem solving.										
LO2	Know the approach and algorithms to solve specific fundamental problems.										
LO3	Understand the efficient approach to solve specific factoring-related problems.										
LO4	Understand the efficient array-related techniques to solve specific problems.										
LO5	Understand the efficient methods to solve specific problems related to text processing. Understand how recursion works.										
<b>UNIT</b>	<b>Details</b>									<b>No. of Hours</b>	
I	<b>Introduction:</b> Notion of algorithms and programs – Requirements for solving problems by computer – The problem-solving aspect: Problem definition phase, Getting started on a problem, The use of specific examples, Similarities among problems, Working backwards from the solution – General problem-solving strategies - Problem solving using top-down design – Implementation of algorithms – The concept of Recursion.									6	
II	<b>Fundamental Algorithms:</b> Exchanging the values of two variables – Counting - Summation of a set of numbers - Factorial computation - Sine function computation - Fibonacci Series generation - Reversing the digits of an integer – Base Conversion.									6	

III	<b>Factoring Methods:</b> Finding the square root of a number – The smallest divisor of an integer – Greatest common divisor of two integers - Generating prime numbers – Computing the prime factors of an integer – Generation of pseudo-random numbers - Raising a number to a large power – Computing the $n$ th Fibonacci number.	6
IV	<b>Array Techniques:</b> Array order reversal – Array counting or histogramming – Finding the maximum number in a set - Removal of duplicates from an ordered array - Partitioning an array – Finding the $k^{\text{th}}$ smallest element – Longest monotone subsequence.	6
V	<b>Text Processing and Pattern Searching:</b> Text line length adjustment – Left and right justification of text – Keyword searching in text – Text line editing – Linear pattern search. <b>Recursive algorithms:</b> Towers of Hanoi – Permutation generation.	6
<b>Total</b>		<b>30</b>
<b>Course Outcomes</b>		<b>Programme Outcome</b>
CO	On completion of this course, students will	
1	Understand the logic of problem and analyses implementation of algorithm and TopDown approach and concept of Recursion	PO1,PO6
2	Able to understand the Sequence of Numbers and Series Fibonacci, Reversing ,Base Conversion.	PO2
3	Able to do Algebraic operations	PO2,PO4
4	Coverage of Arrays and its Logics	PO6,PO8
5	Text Processing and Pattern Searching Approach	PO7
<b>Text Book</b>		
1	R. G. Dromey, <i>How to Solve it by Computer</i> , Pearson India, 2007	
<b>Reference Books</b>		
1.	George Polya, Jeremy Kilpatrick, <i>The Stanford Mathematics Problem Book: With Hints and Solutions</i> , Dover Publications, 2009 (Kindle Edition 2013).	
2.	Greg W. Scragg, <i>Problem Solving with Computers</i> , Jones & Bartlett 1st edition, 1996.	
<b>Web Resources</b>		
1.	<a href="https://www.studytonight.com/">https://www.studytonight.com/</a>	
2.	<a href="https://www.w3schools.com/">https://www.w3schools.com/</a>	

**Mapping with Programme Outcomes:**

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

<b>CO 3</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>3</b>
<b>CO 4</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>
<b>CO 5</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>2</b>
<b>Weightage of course contributed to each PSO</b>	11	12	8	9	13	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
	<b>OFFICE AUTOMATION</b>	Specific Elective	-	Y	-	-	2	2	25	75	100
<b>Course Objective</b>											
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	Details										No. of Hours
I	<b>Introductory concepts:</b> Memory unit– CPU-Input Devices: Key board, Mouse and Scanner.Outputdevices:Monitor,Printer.IntroductiontoOperatingsystems&itsfeatures:DOS– UNIX–Windows. IntroductiontoProgrammingLanguages.										6
II	<b>Word Processing: Open, Save and close word document; Editing text – tools, formatting, bullets;SpellChecker - Document formatting – Paragraph alignment, indentation, headers and footers,numbering;printing–Preview,options,merge.</b>										6
III	<b>Spreadsheets:Excel– opening,enteringtextanddata,formatting,navigating;Formulas– entering,handlingand copying;Charts–creating,formatting and printing,analysisables,preparationoffinancialstatements,introductionto dataanalytics.</b>										6

IV	<b>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 datafiles; Understanding Programming environment in DBMS; Developing menu drive applications in query language (MS-Access).</b>	6
V	<b>Power point: Introduction to Power point - Features – Understanding slide typecasting &amp; viewingslides – creating slide shows. Applying special object – including objects &amp; pictures – Slidetransition– Animation effects, audio inclusion, timers.</b>	6
<b>Total</b>		<b>30</b>
<b>Course Outcomes</b>		<b>Programme Outcomes</b>
CO	On completion of this course, students will	
1	Possess the knowledge on the basics of computers and its components	PO1, PO2, PO3, PO6, PO8
2	Gain knowledge on Creating Documents, spreadsheet and presentation.	PO1, PO2, PO3, PO6
3	Learn the concepts of Database and implement the Query in Database.	PO3, PO5, PO7
4	Demonstrate the understanding of different automation tools.	PO3, PO4, PO5, PO7
5	Utilize the automation tools for documentation, calculation and presentation purpose.	PO4, PO6, PO7, PO8
<b>Text Book</b>		
1	<b>Peter Norton, “Introduction to Computers” – Tata McGraw-Hill.</b>	
<b>Reference Books</b>		
1.	Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, “Microsoft 2003”, Tata McGrawHill.	
<b>Web Resources</b>		
1.	<a href="https://www.udemy.com/course/office-automation-certificate-course/">https://www.udemy.com/course/office-automation-certificate-course/</a>	
2.	<a href="https://www.javatpoint.com/automation-tools">https://www.javatpoint.com/automation-tools</a>	

**Mapping with Programme Outcomes:**

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

<b>CO 5</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>3</b>
<b>Weightage of course contributed to each PSO</b>	13	10	8	13	10	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
	<b>Quantitative Aptitude</b>	Specific Elective	Y	-	-	-	2	2	25	75	100
<b>Course Objective</b>											
LO1	To understand the basic concepts of numbers										
LO2	Understand and apply the concept of percentage, profit & loss										
LO3	To study the basic concepts of time and work, interests										
LO4	To learn the concepts of permutation, probability, discounts										
LO5	To study about the concepts of data representation, graphs										
UNIT	Details							No. of Hours	Course Objective		
I	Numbers-HCF and LCM of numbers-Decimal fractions-Simplification-Squareroot and cuberoots - Average-problems on Numbers.							6	CO1		
II	Problems on Ages - Surds and Indices - percentage - profits and loss - ratio and proportion-partnership-Chainrule.							6	CO2		
III	Time and work - pipes and cisterns - Time and Distance - problems on trains -Boats and streams - simple interest - compound interest - Logarithms - Area-Volume and surfacearea -races and Gamesofskill.							6	CO3		
IV	Permutation and combination-probability-True Discount-Bankers Discount – Height and Distances-Oddmanout & Series.							6	CO4		
V	Calendar - Clocks - stocks and shares - Data representation - Tabulation – BarGraphs-Piecharts-Linegraphs.							6	CO5		
<b>Total</b>							<b>60</b>				

Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
1	understand the concepts, application and the problems of numbers	PO1
2	To have basic knowledge and understanding about percentage, profit & loss related processings	PO1, PO2
3	To understand the concepts of time and work	PO4, PO6
4	Speaks about the concepts of probability, discount	PO4, PO5, PO6
5	Understanding the concept of problem solving involved in stocks & shares, graphs	PO3, PO8
<b>Text Book</b>		
1	“Quantitative Aptitude”, R.S. AGGARWAL., S.Chand & Company Ltd.,	
<b>Reference Books</b>		
1.		
<b>Web Resources</b>		
1.	<a href="https://www.javatpoint.com/aptitude/quantitative">https://www.javatpoint.com/aptitude/quantitative</a>	
2.	<a href="https://www.toppr.com/guides/quantitative-aptitude/">https://www.toppr.com/guides/quantitative-aptitude/</a>	

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	2	3	1	2	-	2
CO 2	2	2	2	3	3	1
CO 3	3	2	2	2	3	3
CO 4	3	2	3	2	3	3
CO 5	2	3	1	2	3	3
<b>Weightage of course contributed to each PSO</b>	12	12	9	11	12	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

SKILL ENHANCEMENT COURSE	Open Source Software Technologies		C	-	-	-	2	2	25	75	100	
<b>Course Objective</b>												
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	C O	
I	Open Source – open source vs. commercial software – What is Linux – Free Software – Where I can use Linux - Linux kernel – Linux distributions.									6	C1	
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 StreamEditor									6	C2	
III	Introduction - Apache Explained – Starting, Stopping and Restarting Apache –Modifying the Default configuration – Securing Apache – Set user and Group									6	C3	
IV	<b>UNIT IV: MySQL:</b> Introduction to MySQL – The show databases and table – The USE command –Create Database and Tables – Describe Table – Select, Insert, Update and Delete statementdatabase.									6	C4	
V	<ul style="list-style-type: none"> <li><b>Introduction</b> –PHP Form processing – Database Access with PHP – MySQL, MySQL Functions – Inserting Records – Selecting Records – Deleting Records – Update Records.</li> </ul>									6	C6	
<b>Total</b>									<b>30</b>			
Course Outcomes									Programmeme Outcomea			
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		
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
<b>Text Book</b>		
1	3. James Lee and Brent Ware “Open Source Web Development with LAMP using	
2	4. LINUX, Apache, MySQL, Perl and PHP”, Dorling Kindersley (India) Pvt. Ltd, 2008.	
<b>Reference Books</b>		
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.	5. Naramore Eligabette, Gerner Jason, Wrox Press, Wiley Dreamtech Press, “Beginning PHP5, Apache, MySQL Web Development”, 2005.	
<b>Web Resources</b>		
1.	<a href="#">Introduction to Open-Source and its benefits - GeeksforGeeks</a>	
2.	<a href="https://www.bing.com/">https://www.bing.com/</a>	

**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

<b>CO 4</b>	2	-	3	3	3	1
<b>CO 5</b>	3	3	3	3	3	2
<b>Weightage of course contributed to each PSO</b>	12	9	13	10	12	8

**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
	<b>Multimedia Systems</b>	Specific Elective	Y	-	-	-	2	2	25	75	100
<b>Course Objective</b>											
LO1	Understand the definition of Multimedia										
LO2	To study about the Image File Formats, SoundsAudio 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	Details							No. of Hours	Course Objective		
<b>I</b>	Multimedia Definition-Use Of Multimedia-Delivering Multimedia- Text:About Fonts and Faces - Using Text in Multimedia -Computers and Text Font Editing and DesignTools-HypermediaandHypertext.							12	C1		
<b>II</b>	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 SoundtoMultimediaProject							12	C2		
<b>III</b>	Animation:The Power of Motion-Principles of Animation-Animation by Computer - Making Animations that Work. Video: Using Video -										

	Working with Video and Displays-DigitalVideoContainers-ObtainingVideo Clips - ShootingandEditingVideo	12	C3
IV	<b>Making Multimedia: The Stage of Multimedia Project - The Intangible Needs -The Hardware Needs - The Software Needs - An Authoring Systems Needs-MultimediaProductionTeam.</b>	12	C4
V	PlanningandCosting:TheProcessofMakingMultimedia-Scheduling-Estimating - RFPs and Bid Proposals. Designing and Producing - Content andTalent:AcquiringContent-OwnershipofContentCreatedforProject-AcquiringTalent	12	C5
<b>Total</b>		<b>60</b>	
<b>Course Outcomes</b>		<b>Programme Outcomes</b>	
<b>CO</b>	On completion of this course, students will		
<b>1</b>	understand the concepts, importance, application and the process of developing multimedia	PO1	
<b>2</b>	to have basic knowledge and understanding about image related processings	PO1, PO2	
<b>3</b>	To understand the framework of frames and bit images to animations	PO4, PO6	
<b>4</b>	Speaks about the multimedia projects and stages of requirement in phases of project.	PO4, PO5, PO6	
<b>5</b>	Understanding the concept of cost involved in multimedia planning, designing, and producing	PO3, PO8	
<b>Text Book</b>			
<b>1</b>	<b>TayVaughan,"Multimedia:MakingItWork",8thEdition,Osborne/McGraw-Hill,2001.</b>		
<b>Reference Books</b>			
<b>1.</b>	<b>RalfSteinmetz&amp;KlaraNahrstedt"MultimediaComputing,Communication&amp;Applications",PearsonEducation,2012.</b>		
<b>Web Resources</b>			
<b>1.</b>	<a href="https://www.geeksforgeeks.org/multimedia-systems-with-features-or-characteristics/">https://www.geeksforgeeks.org/multimedia-systems-with-features-or-characteristics/</a>		

**Mapping with Programme Outcomes:**

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

<b>CO 3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>1</b>
<b>CO 4</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>1</b>
<b>CO 5</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>1</b>	<b>1</b>
<b>Weightage of course contributed to each PSO</b>	15	11	15	15	8	5

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

Subject Code	Subject Name	C	a	t	L	T	P	S	C	I	Marks		
											CIA	External	Total
	<b>Advanced Excel</b>	Specific	Y	-	-	-	-	2	2	25	75	100	
<b>Course Objective</b>													
LO1	Handle large amounts of data												
LO2	Aggregate numeric data and summarize into categories and subcategories												
LO3	Filtering, sorting, and grouping data or subsets of data												
LO4	Create pivot tables to consolidate data from multiple files												
LO5	Presenting data in the form of charts and graphs												
<b>UNIT</b>	<b>Details</b>								<b>No. of Hours</b>	<b>Course Objective</b>			

I	Basics of Excel- Customizing common options- Absolute and relative cells- Protecting and un-protecting worksheets and cells- Working with Functions - Writing conditional expressions - logical functions - lookup and reference functions- VlookUP with Exact Match, Approximate Match- Nested VlookUP with Exact Match- VlookUP with Tables, Dynamic Ranges- Nested VlookUP with Exact Match- Using VLOOKUP to consolidate Data from Multiple Sheets	6	C1
II	Data Validations - Specifying a valid range of values - Specifying a list of valid values- Specifying custom validations based on formula - Working with Templates Designing the structure of a template- templates for standardization of worksheets - Sorting and Filtering Data - Sorting tables- multiple-level sorting- custom sorting- Filtering data for selected view - advanced filter options- Working with Reports Creating subtotals- Multiple-level subtotal.	6	C2
III	Creating Pivot tables Formatting and customizing Pivot tables- advanced options of Pivot tables- Pivot charts- Consolidating data from multiple sheets and files using Pivot tables- external data sources- data consolidation feature to consolidate data- Show Value As % of Row, % of Column, Running Total, Compare with Specific Field- Viewing Subtotal under Pivot- Creating Slicers.	6	C3
IV	More Functions Date and time functions- Text functions- Database functions- Power Functions - Formatting Using auto formatting option for worksheets- Using conditional formatting option for rows, columns and cells- What If Analysis - Goal Seek- Data Tables- Scenario Manager.	6	C4
V	Charts - Formatting Charts- 3D Graphs- Bar and Line Chart together- Secondary Axis in Graphs- Sharing Charts with PowerPoint / MS Word, Dynamically- New Features	6	C5

	Of Excel Sparklines, Inline Charts, data Charts- Overview of all the new features.		
<b>Total</b>		<b>30</b>	
<b>Course Outcomes</b>		<b>Programme Outcomes</b>	
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 No-SQL databases and management.	PO3, PO8	
<b>Text Book</b>			
1	<b>Excel 2019 All</b>		
2	<b>Microsoft Excel 2019 Pivot Table Data Crunching</b>		
<b>Reference Books</b>			
<b>Web Resources</b>			
1.	<a href="https://www.simplilearn.com">https://www.simplilearn.com</a>		
2	<a href="https://www.javatpoint.com">https://www.javatpoint.com</a>		
3	<a href="https://www.w3schools.com">https://www.w3schools.com</a>		

**Mapping with Programme Outcomes:**

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

<b>CO 5</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>3</b>
<b>Weightage of course contributed to each PSO</b>	14	11	8	9	8	10

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

Subject Code	Subject Name	Category	L	T	P	S			Marks		
										Final	Total
	<b>Biometrics</b>	Specific Elective	Y	-	-	-	2	2	25	75	100
<b>Course Objectives</b>											
LO1	Identify the various biometric technologies.										
LO2	Design of biometric recognition.										
LO3	Develop simple applications for privacy										
LO4	Understand the need of biometric in the society										
LO5	Understand the scope of biometric techniques										
UNIT	Details							No. of Hours	Course Objectives		
I	<p><b>Introduction:</b> What is Biometrics, History, Types of biometric Traits, General architecture of biometric systems, Basic working of biometric matching, Biometric system error and performance measures, Design of biometric system, Applications of biometrics, Biometrics versus traditional authentication methods.</p> <p><b>Face Biometrics:</b> Introduction, Background of Face Recognition, Design of Face Recognition System, Neural Network for Face Recognition, Face Detection in Video Sequences, Challenges in Face Biometrics, .7 Face Recognition Methods, Advantages and Disadvantages.</p>							6	CO1		
II	<p><b>Retina and Iris Biometrics:</b> Introduction, Performance of Biometrics, Design of Retina Biometrics, Design of Iris Recognition System, Iris Segmentation Method , Determination of Iris Region, Determination of Iris Region, Applications of Iris Biometrics, Advantages and Disadvantages</p> <p><b>Vein and Fingerprint Biometrics:</b> Introduction,</p>							6	CO2		

	Biometrics Using Vein Pattern of Palm, Fingerprint Biometrics, Fingerprint Recognition System, Minutiae Extraction, Fingerprint Indexing, Experimental Results, Advantages and Disadvantages.		
III	<p><b>Privacy Enhancement Using Biometrics:</b> Introduction, Privacy Concerns Associated with Biometric Deployments, Identity and Privacy, Privacy Concerns, Biometrics with Privacy Enhancement, Comparison of Various Biometrics in Terms of Privacy, Soft Biometrics.</p> <p><b>Multimodal Biometrics:</b> Introduction to Multimodal Biometrics, Basic Architecture of Multimodal Biometrics, Multimodal Biometrics Using Face and Ear, Characteristics and Advantages of Multimodal Biometrics, Characteristics and Advantages of Multimodal Biometrics.</p>	6	CO3
IV	<p><b>Watermarking Techniques:</b> Introduction, Data Hiding Methods, Basic Framework of Watermarking, Classification of Watermarking, Applications of Watermarking, Attacks on Watermarks, Performance Evaluation, Characteristics of Watermarks, General Watermarking Process, Image Watermarking Techniques, Watermarking Algorithm, Experimental Results, Effect of Attacks on Watermarking Techniques, Attacks on Spatial Domain Watermarking.</p>	6	CO4
V	<p><b>Scope and Future:</b> Scope and Future Market of Biometrics, Biometric Technologies, Applications of Biometrics, Biometrics and Information Technology Infrastructure, Role of Biometrics in Enterprise Security, Role of Biometrics in Border Security, Smart Card Technology and Biometrics, Radio Frequency Identification (RFID) Biometrics, DNA Biometrics, Comparative Study of Various Biometric Techniques.</p> <p><b>Biometric Standards:</b> Introduction, Standard Development Organizations, Application Programming Interface (API), Information Security and Biometric Standards, Biometric Template Interoperability.</p>	6	CO5
	<b>Total</b>	<b>30</b>	
<b>Course Outcomes</b>			
<b>Course Outcomes</b>	On completion of this course, students will;		
<b>CO1</b>	To understand the basic concepts and the functionality of the Biometrics, Face Biometrics, Types, Architecture and	PO1, PO3, PO6, PO8	

	Applications.	
<b>CO2</b>	To know the concepts Retina and Iris Biometrics and Vein and Fingerprint Biometrics.	PO1,PO2,PO3,PO6
<b>CO3</b>	To analyse the Privacy Enhancement and Multimodal Biometrics.	PO3, PO5
<b>CO4</b>	To get analyticalidea on Watrmarking Techniques	PO1, PO2, PO3, PO7
<b>CO5</b>	To Gain knowledge on Future scope of Biometrics,and Study of various Biometric Techniques.	PO2, PO6, PO7
<b>Recommended Text</b>		
1.	Biometrics: Concepts and Applications by G.R Sinha and SandeepB.Patil , Wiley, 2013	
<b>References Books</b>		
1.	Guide to Biometrics by Ruud M. Bolle , SharathPankanti, Nalinik.Ratha, Andrew W.Senior, Jonathan H. Connell , Springer 2009	
2.	Introduction to Biometrics by Anil k. Jain, Arun A. Ross, KarthikNandakumar	
3.	Hand book of Biometrics by Anil K. Jain, Patrick Flynn, ArunA.Ross.	
<b>Web Resources</b>		
1.	<a href="https://www.tutorialspoint.com/biometrics/index.htm">https://www.tutorialspoint.com/biometrics/index.htm</a>	
2.	<a href="https://www.javatpoint.com/biometrics-tutorial">https://www.javatpoint.com/biometrics-tutorial</a>	
3.	<a href="https://www.thalesgroup.com/en/markets/digital-identity-and-security/government/inspired/biometrics">https://www.thalesgroup.com/en/markets/digital-identity-and-security/government/inspired/biometrics</a>	

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
<b>CO 1</b>	1	3	2	2	1	1
<b>CO 2</b>	3	1	3	2	3	3
<b>CO 3</b>	3	2	1	-	2	3
<b>CO 4</b>	3	-	3	3	3	1
<b>CO 5</b>	3	3	3	3	1	2
<b>Weightage of course contributed to each PSO</b>	13	9	12	10	10	10

**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
	<b>Cyber Forensics</b>	Specific Elective	Y	-	-	-	2	2	25	75	100
<b>Course Objective</b>											
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	Details						No. of Hours	Course Objective			
<b>I</b>	<b>Overview of Computer Forensics Technology:</b> Computer Forensics Fundamentals: What is Computer Forensics Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of professional Forensics Methodology, Steps taken by Computer Forensics Specialists. Types of Computer Forensics Technology: Types of Business Computer Forensic, Technology–Types of Military Computer Forensic Technology–Types of Law Enforcement–Computer Forensic. Technology–Types of Business Computer Forensic Technology.						6	C1			
<b>II</b>	<b>Computer Forensics Evidence and capture:</b> 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, The Rules of Evidence, Volatile Evidence, General Procedure, Collection and Archiving, Methods of						6	C2			

	Collections, Artefacts, Collection Steps, Controlling Contamination: The chain of custody.		
<b>III</b>	<b>Duplication and Preservation of Digital Evidence:</b> Processing steps, Legal Aspects of collecting and Preserving Computerforensic Evidence. Computer image Verification and Authentication: Special needs of Evidential Authentication, Practical Consideration, Practical Implementation.	6	C3
<b>IV</b>	<b>Computer Forensics Analysis:</b> Discovery of Electronic Evidence: Electronic Document Discovery: A Powerful New Litigation Tool. Identification of Data: Time Travel, Forensic Identification and Analysis of Technical Surveillance Devices.	6	C4
<b>V</b>	<b>Reconstructing Past Events:</b> 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, Documenting The Intrusion on Destruction of Data, System Testing.	6	C5
	<b>Total</b>	<b>30</b>	
<b>Course Outcomes</b>		<b>Programme Outcomes</b>	
<b>CO</b>	On completion of this course, students will		
<b>1</b>	Understand the definition of computer forensics fundamentals.		PO1
<b>2</b>	Evaluate the different types of computer forensics technology.		PO1, PO2
<b>3</b>	Analyze various computer forensics systems.		PO4, PO6
<b>4</b>	Apply the methods for data recovery, evidence collection and data seizure.		PO4, PO5, PO6
<b>5</b>	Gain your knowledge of duplication and preservation of digital evidence.		PO3, PO8
<b>Text Book</b>			
<b>1</b>	John R. Vacca, "Computer Forensics: Computer Crime Investigation", 3/E, Firewall Media, New Delhi, 2002.		
<b>Reference Books</b>			
<b>1.</b>	Nelson, Phillips Einfinger, Stuart, "Computer Forensics and Investigations" Einfinger, Stuart,		

	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.
<b>Web Resources</b>	
1.	<a href="https://www.vskills.in">https://www.vskills.in</a>
2.	<a href="https://www.hackingarticles.in/best-of-computer-forensics-tutorials/">https://www.hackingarticles.in/best-of-computer-forensics-tutorials/</a>

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	2	3	-	2	2	3
CO 2	3	-	-	2	3	-
CO 3	-	2	1	-	2	3
CO 4	3	3	1	3	3	2
CO 5	3	2	1	3	-	3
<b>Weightage of course contributed to each PSO</b>	11	10	3	10	10	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
	<b>Pattern Recognition</b>	Specific Elective	Y	-	-	-	2	2	75	25	100
<b>Course Objective</b>											
LO1	To learn the fundamentals of Pattern Recognition techniques										
LO2	To learn the various Statistical Pattern recognition techniques										
LO3	To learn the linear discriminant functions and unsupervised learning and clustering										
LO4	To learn the various Syntactical Pattern recognition techniques										
LO5	To learn the Neural Pattern recognition techniques										

UNIT	Details	No. of Hours	Course Objective
I	<b>PATTERN RECOGNITION OVERVIEW:</b> Pattern recognition, Classification and Description-Patterns and feature Extraction with Examples-Training and Learning in PR systems-Pattern recognition Approaches	6	CO1
II	<b>STATISTICAL PATTERN RECOGNITION:</b> Introduction to statistical Pattern Recognition-supervised Learning using Parametric and Non-Parametric Approaches.	6	CO2
III	<b>LINEAR DISCRIMINANT FUNCTIONS AND UNSUPERVISED LEARNING AND CLUSTERING:</b> Introduction-Discrete and binary Classification Problems- Techniques to directly Obtain linear Classifiers - Formulation of Unsupervised Learning Problems-Clustering for unsupervised learning and classification	6	CO3
IV	<b>SYNTACTIC PATTERN RECOGNITION:</b> Overview of Syntactic Pattern Recognition-Syntactic recognition via parsing and other grammars-Graphical Approaches to syntactic pattern recognition-Learning via grammatical inference.	6	CO4
V	<b>NEURAL PATTERN RECOGNITION:</b> Introduction to Neural Networks-Feed-forward Networks and training by Back Propagation-Content Addressable Memory Approaches and Unsupervised Learning in Neural PR	6	CO5
	<b>Total</b>		
<b>Course Outcomes</b>		<b>Programme Outcomes</b>	
CO	On completion of this course, students will		
1	understand the concepts, importance, application and the process of developing Pattern recognition over view	PO1	
2	to have basic knowledge and understanding about parametric and non-parametric related concepts.	PO1, PO2	
3	To understand the framework of frames and bit images to animations	PO4, PO6	
4	Speaks about the multimedia projects and stages of requirement in phases of project.	PO4, PO5, PO6	
5	Understanding the concept of cost involved in multimedia planning, designing, and producing	PO3, PO8	
<b>Text Book</b>			
1	Robert Schalkoff, "Pattern Recognition: Statistical Structural and Neural Approaches", John		

	wiley & sons.
2	Duda R.O., P.E.Hart & D.G Stork, “ Pattern Classification”, 2nd Edition, J.Wiley.
3	Duda R.O.& Hart P.E., “Pattern Classification and Scene Analysis”, J.wiley.
4	Bishop C.M., “Neural Networks for Pattern Recognition”, Oxford University Press.
<b>Reference Books</b>	
1.	1. Earl Gose, Richard johnsonbaugh, Steve Jost, “Pattern Recognition and Image Analysis”, Prentice Hall of India, Pvt Ltd, New Delhi.
<b>Web Resources</b>	
1.	<a href="https://www.geeksforgeeks.org/pattern-recognition-introduction/">https://www.geeksforgeeks.org/pattern-recognition-introduction/</a>
2.	<a href="https://www.mygreatlearning.com/blog/pattern-recognition-machine-learning/">https://www.mygreatlearning.com/blog/pattern-recognition-machine-learning/</a>

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	2	3	1	2	-	2
CO 2	2	2	2	3	3	1
CO 3	3	2	-	3	2	3
CO 4	3	3	3	2	3	3
CO 5	2	3	1	2	3	2
<b>Weightage of course contributed to each PSO</b>	12	13	7	12	11	11

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

Subject Code	Subject Name	Category	L	T	P	S			Marks		
										Final	Total
	ERP	Specific Elective	Y	-	-	-	4	4	25	75	100
<b>Course Objectives</b>											
LO1	To understand the basic concepts, Evolution and Benefits of ERP.										

LO2	To know the need and Role of ERP in logical and Physical Integration.		
LO3	Identify the important business functions provided by typical business software such as enterprise resource planning and customer relationship management		
LO4	To train the students to develop the basic understanding of how ERP enriches the business organizations in achieving a multidimensional growth		
LO5	To aim at preparing the students technological competitive and make them ready to self-upgrade with the higher technical skills		
<b>UNIT</b>	<b>Details</b>	<b>No. of Hours</b>	<b>Course Objectives</b>
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	CO1
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	CO2
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	CO3
IV	ERP Implementation Basics, , ERP implementation Strategy, ERP Implementation Life Cycle ,Pre-Implementation task,Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees.	6	CO4
V	ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into or-ganizational culture. Using ERP tool: either SAP or ORACLE format to case study.	6	CO5
	<b>Total</b>	<b>30</b>	
<b>Course Outcomes</b>			

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, PO8
CO3	Understand and apply the concepts of ERP Manufacturing Perspective and ERP Modules	PO1, PO3, PO7
CO4	Discuss the benefits of ERP	PO2, PO6
CO5	Apply different tools used in ERP	PO1, PO3, PO8
<b>Reference Text :</b>		
1.	Enterprise Resource Planning – Alexis Leon, Tata McGraw Hill.	
<b>References :</b>		
1.	<b>Enterprise Resource Planning – Diversified by Alexis Leon, TMH.</b>	
2.	<b>Enterprise Resource Planning – Ravi Shankar &amp; S. Jaiswal , Galgotia</b>	
<b>Web Resources</b>		
1.	1. <a href="https://www.tutorialspoint.com/management_concepts/enterprise_resource_planning.htm">https://www.tutorialspoint.com/management_concepts/enterprise_resource_planning.htm</a>	
2.	1. <a href="https://www.saponlinetutorials.com/what-is-erp-systems-enterprise-resource-planning/">https://www.saponlinetutorials.com/what-is-erp-systems-enterprise-resource-planning/</a>	
3.	1. <a href="https://www.guru99.com/erp-full-form.html">https://www.guru99.com/erp-full-form.html</a>	
4.	2. <a href="https://www.oracle.com/in/erp/what-is-erp/">https://www.oracle.com/in/erp/what-is-erp/</a>	

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	1	3	2	1	3	2
CO 2	3	2	-	1	2	-
CO 3	2	3	2	2	3	2
CO 4	1	-	2	1	-	2
CO 5	3	3	-	1	3	-
<b>Weightage of course contributed to each PSO</b>	10	11	6	7	11	6

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

Subject Code	Subject Name	U	A	T	P	S			Marks
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		Category					Credits	Inst. Hours	CIA	External	Total
	<b>Robotics and Its Applications</b>	Specific Elective	Y	-	-	-	2	2	25	75	100
<b>Course Objective</b>											
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	Course Objective			
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.						6	CO1			
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						6	CO2			
III	Localization: Self-localizations and mapping - Challenges in localizations – IR based localizations – vision based localizations – Ultrasonic based localizations - GPS localization systems.						6	CO3			
IV	Path Planning: Introduction, path planning-overview-road map path planning-cell decomposition path planning						6	CO4			

	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		
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.	6	CO5
<b>Total</b>			
<b>Course Outcomes</b>		<b>Programme Outcomes</b>	
CO	On completion of this course, students will		
1	Describe the different physical forms of robot architectures.	PO1	
2	Kinematically model simple manipulator and mobile robots.	PO1, PO2	
3	Mathematically describe a kinematic robot system	PO4, PO6	
4	Analyze manipulation and navigation problems using knowledge of coordinate frames, kinematics, optimization, control, and uncertainty.	PO4, PO5, PO6	
5	Program robotics algorithms related to kinematics, control, optimization, and uncertainty.	PO3, PO8	
<b>Text Book</b>			
1	RichardD.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		
<b>Reference Books</b>			
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		
<b>Web Resources</b>			
1.	<a href="https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_robotics.htm">https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_robotics.htm</a>		
2.	<a href="https://www.geeksforgeeks.org/robotics-introduction/">https://www.geeksforgeeks.org/robotics-introduction/</a>		

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**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	2	2	2	1	3	-
CO 2	2	2	2	3	1	3
CO 3	3	2	3	2	1	3
CO 4	3	3	2	2	2	1
CO 5	3	2	1	3	3	3
<b>Weightage of course contributed to each PSO</b>	13	11	10	11	10	10

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

Subject Code	Subject Name	Category	L	T	P	S			Marks		
											Total
	<b>Simulation and Modeling</b>	Specific Elective	Y	-	-	-	2	2	25	75	100
<b>Course Objectives</b>											
LO1	Generates computer simulation technologies and techniques, lays the groundwork for students to comprehend computer simulation requirements, and implements and tests a variety of simulation and data analysis libraries and programmes. This course focuses on what is required to create simulation software environments rather than just simulations using pre-existing packages										
LO2	Discuss the concepts of modelling layers of critical infrastructure networks in society.										
LO3	Create tools for viewing and controlling simulations and their results.										
LO4	Understand the concept of Entity modelling, Path planning										
LO5	To learn about the Algorithms and Modelling.										
LO1	<b>Details</b>						<b>No. of Hours</b>		<b>Course Objectives</b>		
I	Introduction To Modeling & Simulation – What is Modeling and Simulation – Complexity Types – Model Types – Simulation Types – M&S Terms and Definitions Input Data Analysis – Simulation Input Modeling – Input						6		CO1		

	Data Collection - Data Collection Problems - -- Input Modeling Strategy - Histograms -Probability Distributions - Selecting a Probability Distribution.		
II	Random Variate Generation – Random Numbers – Random Number Generators – General principles – Inverse Transform Method –Acceptance Rejection Method –Composition Method –Relocate and Rescale Method - Specific distributions-Output Data Analysis – Introduction -Types of Simulation With Respect to Output Analysis - Stochastic Process and Sample Path - Sampling and Systematic Errors - Mean, Standard Deviation and Confidence Interval - Analysis of Finite-Horizon Simulations - Single Run - Independent Replications - Sequential Estimation – Analysis of Steady-State Simulations - Removal of Initialization Bias (Warm-up Interval) - Replication-Deletion Approach - Batch-Means Method .	6	CO2
III	Comparing Systems via Simulation – Introduction – Comparison Problems - Comparing Two Systems - Screening Problems - Selecting the Best - Comparison with a Standard - Comparison with a Fixed Performance Discrete Event Simulations – Introduction - Next-Event Time Advance - Arithmetic and Logical Relationships - Discrete-Event Modeling Approaches – Event-Scheduling Approach – Process Interaction Approach.	6	CO3
IV	Entity Modeling – Entity Body Modeling – Entity Body Visualization – Entity Body Animation – Entity Interaction Modeling – Building Modeling Distributed Simulation – High Level Architecture (HLA) – Federation Development and Execution Process (FEDEP) – SISO RPR FOM Behavior Modeling – General AI Algorithms - Decision Trees - Neural Networks - Finite State Machines - Logic Programming - Production Systems – Path Planning - Off-Line Path Planning - Incremental Path Planning - Real-Time Path Planning – Script Programming -Script Parsing - Script	6	CO4

	Execution.		
V	Optimization Algorithms – Genetic Algorithms – Simulated Annealing Examples: Sensor Systems Modeling – Human Eye Modeling – Optical Sensor Modeling – Radar Modeling.	6	CO5
	<b>Total</b>	<b>30</b>	
<b>Course Outcomes</b>			
<b>Course Outcomes</b>	On completion of this course, students will;	<b>Programme Outcomes</b>	
<b>CO1</b>	Introduction To Modeling & Simulation, Input Data Analysis and Modeling.	PO1	
<b>CO2</b>	Random Variate and Number Generation. Analysis of Simulations and methods.	PO1, PO2	
<b>CO3</b>	Comparing Systems via Simulation	PO4, PO6	
<b>CO4</b>	Entity Body Modeling, Visualization, Animation.	PO4, PO5, PO6	
<b>CO5</b>	Algorithms and Sensor Modeling.	PO3, PO8	
<b>Text Books</b>			
1.	Jerry Banks, “Handbook of Simulation: Principles, Methodology, Advances, Applications, and Practice”, John Wiley & Sons, Inc., 1998.		
2.	George S. Fishman, “Discrete-Event Simulation: Modeling, Programming and Analysis”, Springer-Verlag New York, Inc., 2001.		
<b>References Books</b>			
1.	<b>Andrew F. Seila, Vlatko Ceric, Pandu Tadikamalla, “Applied Simulation Modeling”, Thomson Learning Inc., 2003.</b>		
<b>Web Resources</b>			
1.	<a href="https://www.tutorialspoint.com/modelling_and_simulation/index.htm">https://www.tutorialspoint.com/modelling_and_simulation/index.htm</a>		
2.	<a href="https://www.javatpoint.com/verilog-simulation-basics">https://www.javatpoint.com/verilog-simulation-basics</a>		

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
<b>CO 1</b>	3	3	2	2	-	1
<b>CO 2</b>	3	1	3	2	3	3
<b>CO 3</b>	3	2	-	-	2	3
<b>CO 4</b>	3	-	3	3	3	1

<b>CO 5</b>	3	3	3	3	1	2
<b>Weightage of course contributed to each PSO</b>	15	9	11	10	9	10

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

Subject Code	Subject Name	Category	L	T	P	O			Marks		
											Total
	<b>Organizational Behaviour</b>	Specific Elective	Y	-	-	-	2	2	25	75	100
<b>Learning Objectives</b>											
LO1	To have extensive knowledge on OB and the scope of OB.										
LO2	To create awareness of Individual Behaviour.										
LO3	To enhance the understanding of Group Behaviour										
LO4	To know the basics of Organisational Culture and Organisational Structure										
LO5	To understand Organisational Change, Conflict and Power										
UNIT	Details							No. of Hours	Learning Objectives		
I	<b>INTRODUCTION</b> : Concept of Organizational Behavior (OB): Nature, Scope and Role of OB: Disciplines that contribute to OB; Opportunities for OB (Globalization, Indian workforce diversity, customer service, innovation and change, networked organizations, work-life balance, people skills, positive work environment, ethics)							6	CO1		
II	<b>INDIVIDUAL BEHAVIOUR:</b> 1. Learning, attitude and Job satisfaction: Concept of learning, conditioning, shaping and reinforcement. Concept of attitude, components, behavior and attitude. Job satisfaction: causation; impact of satisfied employees on workplace. 2. Motivation : Concept; Theories (Hierarchy of needs, X and Y, Two factor, McClelland, Goal setting, Self-efficacy, Equity theory); Job characteristics model; Redesigning jobs, 3. Personality and Values : Concept of personality; Myers-Briggs Type Indicator (MBTI); Big Five model. Relevance of values; Linking personality and values to the workplace (person-job fit, person-organization fit) 4. Perception, Decision Making : Perception and Judgements; Factors; Linking perception to individual decision making:							6	CO2		
III	<b>GROUP BEHAVIOUR</b> : 1. Groups and Work Teams :							6	CO3		

	Concept : Five Stage model of group development; Group norms, cohesiveness ; Group think and shift ; Teams; types of teams; Creating team players from individuals and team based work(TBW) 2. Leadership : Concept; Trait theories; Behavioral theories (Ohio and Michigan studies); Contingency theories (Fiedler, Hersey and Blanchard, Path-Goal);		
IV	ORGANISATIONAL CULTURE AND STRUCTURE : Concept of culture; Impact (functions and liability); Creating and sustaining culture: Concept of structure, Prevalent organizational designs: New design options	6	C04
V	ORGANISATIONAL CHANGE, CONFLICT AND POWER: Forces of change; Planned change; Resistance; Approaches (Lewin's model, Organisational development);. Concept of conflict, Conflict process; Types, Functional/ Dysfunctional. Introduction to power and politics.	6	C05
		<b>30</b>	
<b>Course Outcomes</b>	On Completion of the course the students will	<b>Program Outcomes</b>	
<b>CO1</b>	To define Organisational Behaviour, Understand the opportunity through OB.	PO1, PO2, PO6, PO7	
<b>CO2</b>	To apply self-awareness, motivation, leadership and learning theories at workplace.	PO2, PO4, PO5, PO6	
<b>CO3</b>	To analyze the complexities and solutions of group behaviour.	PO1, PO2, PO4, PO5, PO6	
<b>CO4</b>	To impact and bring positive change in the culture of the organization.	PO2, PO3, PO4, PO5, PO8	
<b>CO5</b>	To create a congenial climate in the organization.	PO1, PO2, PO5, PO6, PO8	
<b>Reading List</b>			
1.	Neharika Vohra Stephen P. Robbins, Timothy A. Judge , <i>Organizational Behaviour</i> , Pearson Education, 18 <sup>th</sup> Edition, 2022.		
2.	Fred Luthans, <i>Organizational Behaviour</i> , Tata McGraw Hill, 2017.		
3.	Ray French, Charlotte Rayner, Gary Rees & Sally Rumbles, <i>Organizational Behaviour</i> , John Wiley & Sons, 2011		
4.	Louis Bevoc, Allison Shearsett, Rachael Collinson, <i>Organizational Behaviour Reference</i> , Nutri Niche System LLC (28 April 2017)		
5.	Dr. Christopher P. Neck, Jeffery D. Houghton and Emma L. Murray, <i>Organizational Behaviour: A Skill-Building Approach</i> , SAGE Publications, Inc; 2nd edition (29 November 2018).		
<b>References Books</b>			
1.	Uma Sekaran, <i>Organizational Behaviour Text &amp; cases</i> , 2 <sup>nd</sup> edition, Tata McGraw Hill Publishing CO. Ltd		
2.	Gangadhar Rao, Narayana, V.S.P Rao, <i>Organizational Behaviour</i> 1987, Reprint 2000, Konark Publishers Pvt. Ltd, 1 <sup>st</sup> edition		

3.	S.S. Khanka, Organizational Behaviour, S. Chand & Co, New Delhi.
4.	J. Jayasankar, Organizational Behaviour, Margham Publications, Chennai, 2017.

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	1	2	2	1	3	1
CO 2	3	2	2	3	1	3
CO 3	3	2	3	1	1	3
CO 4	3	3	2	2	2	1
CO 5	3	2	1	3	3	3
<b>Weightage of course contributed to each PSO</b>	13	11	10	10	10	11

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	<b>UNDERSTANDING INTERNET</b>	Specific Elective	2	-	-		2	25	75	100
<b>Learning Objectives</b>										
LO1	Knowledge of Internet medium									
LO2	Internet as a mass medium									
LO3	Features of Internet Technology,									
LO4	Internet as source of infotainment									
LO5	Study of internet audiences and about cyber crime									
<b>UNIT</b>	<b>Contents</b>								<b>No. Of Hours</b>	

I	The emergence of internet as a mass medium – the world of ‘worldwide web’.	6
II	Features of internet as a technology.	6
III	Internet as a source of infotainment – classification based on content and style.	6
IV	Demographic and psychographic descriptions of internet ‘audiences’ – effect of internet on the values and life-styles.	6
V	Present issues such as cyber crime and future possibilities.	6
<b>TOTAL HOURS</b>		<b>30</b>
<b>Course Outcomes</b>		<b>Programme Outcomes</b>
CO	On completion of this course, students will	
CO1	Knows the basic concept in internet Concept of mass medium and world wide web	PO1, PO2, PO3, PO4, PO5, PO6
CO2	<b>Knows the concept of internet as a technology.</b>	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Understand the concept of infotainment and classification based on content and style	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Can be able to know about Demographic and psychographic description of internet	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Understand the concept of cyber crime and future possibilities	PO1, PO2, PO3, PO4, PO5, PO6
<b>Textbooks</b>		
1	01. Barnouw, E and Krishnaswamy S [1990] Indian Film. New York, OUP.	
2	Kumar, Keval [1999] Mass Communication in India. Mumbai, Jaico.	
3	<b>Srivastava, K M [1992] Media Issues. Sterling Publishers Pvt Ltd.</b>	
<b>Reference Book</b>		
1	Acharya, R N [1987] Television in India. Manas Publications, New Delhi.	
2	Barnouw, E [1974] Documentary – A History of Nonfiction. Oxford, OUP	
3	Luthra, H R [1986] Indian Broadcasting. Ministry of I & B, New Delhi.	
4	Vasudev, Aruna [1986] The New Indian Cinema. Macmillan India, New Delhi.	
<b>Web Resources</b>		
1.	<a href="https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf">https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf</a>	
2.	<a href="https://www.w3schools.com/html/default.asp">https://www.w3schools.com/html/default.asp</a>	

**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

<b>CO 4</b>	3	3	3	3	3	3
<b>CO 5</b>	3	3	3	2	3	3
<b>Weightage of course contributed to each PSO</b>	14	15	14	14	15	15

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