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

2023 – 2024 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 whichwillhelpthestudentstoensuresimilarqualityofeducationirrespectiveoftheinstituteandlocation.

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 athand.

PSO4: Understand, formulate, develop programming model with logical approaches to a 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 Compute 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 are as on multiple disciplines linked with Computer Science.

PO7: Equip with Computer science technical ability, problem solving skills, creative talentandpowerofcommunicationnecessaryforvariousformsofemployment.

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 furtherexplorationintomulti-dimensionalaspectsofcomputingsciences.

MappingofCourseLearningOutcomes(CLOs)withProgrammeOutcomes(POs)andProgrammeSpecificOutcomes(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 corecomponentsandincorporatingapplicationorientedcontentwhereverrequired.

☐ The Cores subjects include latest developments in the education and scientific front, advanced programming packages allied with the discipline topics, practical training, devising mathematicalmodelsandalgorithmsforprovidingsolutionstoindustry/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	**Foundation Course** 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.	● Instill confidence among students ● Create interest for the subject
I,II,III,IV	**Skill Enhancement papers** (Discipline centric/Generic/Entrepreneurial)	● Industry ready graduates ● Skilled human resource ● Students are equipped with essential skills to make them employable
		● Training on Computing / Computational skills enablethestudentsgainknowledgeandexposureonlatestcomputational aspects
		● Data analytical skills will enable students gain internships,apprenticeships,fieldworkinvolvingdatacollection,compilation,analysisetc.
		● Entrepreneurial skill training will provide an opportunity for independent livelihood ● Generates self–employment ● Create small scale entrepreneurs ● Training to girls leads to women empowerment
		● DisciplinecentricskillwillimprovetheTechnicalknowhowofsolvingreallifeproblemsusingICT tools

III,IV,V &VI	Elective papers- An open choice of topics categorized under Generic and Discipline Centric	- Strengthening the domain knowledge - Introducing the stakeholders to the State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and interdisciplinary nature - Students are exposed to Latest topics on Computer Science/IT, that require strong mathematical background - 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
IV	Industrial Statistics	- Exposure to industry moulds students into solution providers - Generates Industry ready graduates - Employment opportunities enhanced
II year Vacation activity	Internship /Industrial Training	Practical training at the Industry/ Banking Sector /Private/ Public sector organizations / Educational institutions, enable the students gain professional Experience and also become responsible citizens.
V Semester	Project with Viva–voce	- Self-learning is enhanced - Applicationoftheconcepttorealsituationisconceivedresultingintangibleoutcome
VI Semester	Introduction of Professional Competency component	- Curriculum design accommodates all category of learners;_MathematicsforAdvancedExplain'componentwillcompriseofadvancedtopicsinMathematics and allied fields, for those in the peer group/aspiring researchers; _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.
Extra Credits: For Advanced Learners/Honors degree		To cater to the need so peer learners/research aspirants

Skills acquired from the Courses	Knowledge, Problem Solving ,Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

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				
	23	30		23	30		22	30		25	30		26	30		21	30
Total – 140 Credits																	

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	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	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	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.	---- **Environmental studies**	1	--	--	--	--	--
				30	20				700

SEMESTER–IV

Part	Sub Code	Course Type	Title of the Course	Hrs/ Week	Credits	Exam Hrs	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.	**Environmental studies**	1	2	3	25	75	100

			30	25				900
	SUMMERINTERNSHIP/INDUSTRIALTRAINING							
	*Allied Courses are considered as GEC							

SEMESTER–V

Part	Sub code	Course Type	Title of the Course	Hrs/ Week	Credits	Exam Hrs	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
				30	27				800

SEMESTER–VI

Part	Sub code	Course Type	Title of the Course	Hrs/ Week	Credits	Exam Hrs	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
				30	**22**				**700**

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.	**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.	**U23GU69**	Numerical Methods	

13.	**U23GU70**	Resource Management Techniques	
14.	**U23GU71P**	Multimedia Lab	GEC 2
15.	**U23GU72**	Database Management System	GEC 4
16.	**U23GU73**	Artificial Intelligence	GEC 6
17.,	**U23GU74P**	RDBMS Lab	GEC 5

Skill Enhancement Course

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

18.	**U23SEU18**	Organization Behavior	
19.	**U23SEU19**	Web design	SEC 4
20.	**U23SEU20**	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

COURSE STRUCTURE ABSTRACT   FOR ALL B.C.A Programmes

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
	Total	**46**	**180**	**140**	**4600**

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	**2. Skill Based**
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	

Elective Papers

Section - A	5 questions to be answered under 'either – or' pattern (2 question from each unit)	5 X 15 =75 Marks	**3. Non Major**
	Total	75 Marks	

Elective Papers

Section - A	5 questions to be answered under 'either – or' pattern (2 questions from each unit)	5 X 5 = 25 Marks	4. Value Added Course
Section - B	5 questions to be answered under 'either – or' pattern (2 questions from each unit)	5 X 10 = 50 Marks	
	Total	75 Marks	

Internal   -   20
External   -   30
Total   -   50

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
Learning Objectives										
LO1	To make students understand the concepts of Python programming.									

LO2	To apply the OOPs concept in PYTHON programming.	
LO3	To impart knowledge on demand and supply concepts	
LO4	To make the students learn best practices in PYTHON programming	
LO5	To know the costs and profit maximization	
UNIT	**Contents**	**No. of Hours**
I	**Basics of Python Programming:** History of Python-Features of Python-Literal-Constants-Variables - Identifiers–Keywords-Built-in Data Types-Output Statements – Input Statements-Comments – Indentation- Operators-Expressions-Type conversions. **Python Arrays:** Defining and Processing Arrays – Array methods.	**15**
II	**Control Statements:** Selection/Conditional Branching statements: if, if-else, nested if and if-elif-else statements. Iterative Statements: while loop, for loop, else suite in loop and nested loops. **Jump Statements:** break, continue and pass statements**.**	**15**
III	**Functions:** Function Definition – Function Call – Variable Scope and its Lifetime-Return Statement. **Function Arguments**: Required Arguments, Keyword Arguments, Default Arguments and Variable Length Arguments- Recursion. **Python Strings:** String operations-Immutable Strings - Built-in String Methods and Functions - String Comparison. **Modules**: import statement- The Python module – dir() function – Modules and Namespace – Defining our own modules.	**15**
IV	**Lists:** Creating a list -Access values in List-Updating values in Lists-Nested lists -Basic list operations-List Methods. Tuples: Creating, Accessing, Updating and Deleting Elements in a tuple – Nested tuples– Difference between lists and tuples. **Dictionaries:** Creating, Accessing, Updating and Deleting Elements in a Dictionary – Dictionary Functions and Methods - Difference between Lists and Dictionaries.	**15**
V	**Python File Handling:** Types of files in Python - Opening and Closing files-Reading and Writing files: write() and writelines() methods- append() method – read() and readlines() methods – with keyword – Splitting words – File methods - File Positions- Renaming and deleting files.	**15**
TOTAL HOURS		**75**

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

Textbooks

1	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.

Reference Books

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

Web Resources

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

Mapping with Programme Outcomes:

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

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

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

Course Objectives:

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

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

Course Outcomes	
On completion of this course, students will	
CO1	Demonstrate the understanding of syntax and semantics of
CO2	Identify the problem and solve using PYTHON programming techniques.
CO3	Identify suitable programming constructs for problem solving.
CO4	Analyze various concepts of PYTHON language to solve the problem in an efficient way.
CO5	Develop a PYTHON program for a given problem and test for its correctness.

Mapping with Programme Outcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
U23FU1	**Structured Programming Language in C**	FC	Y	-	-	-	2	2	25	75	100

Course Objective

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

UNIT	Details	No. of Hours	Course Objectives
I	**Overview of C**: Importance of C, sample C program, C program structure, executing C program. Constants, Variables, and Data Types: Character set, C tokens, keywords and identifiers, constants, variables, data types, declaration of variables, Assigning values to variables---Assignment statement, declaring a variable as constant, as volatile. Operators and Expression.	6	CO1
II	**Decision Making and Branching**: Decision making with If, simple IF, IF ELSE, nested IF ELSE , ELSE IF ladder, switch, GOTO statement.**Decision Making and Looping**: While, Do-While, For, Jumps in loops.	6	CO2
III	**Arrays**: Declaration and accessing of one & two-dimensional arrays, initializing two-dimensional arrays, multidimensional arrays.	6	CO3
IV	**Functions**: The form of C functions, Return values and types, calling a function, categories of functions, Nested functions, Recursion, functions with arrays, call by value, call by reference, storage classes-character arrays and string functions	6	CO4
V	**Pointers:** definition, declaring and initializing pointers, accessing a variable through address and through pointer, pointer expressions, pointer increments and scale factor, pointers and arrays, pointers and functions, pointers and structures.	6	CO5
	Total	**30**	

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

	problems	
4	Analyze the various methods of solving a problem and choose the best method	PO4,PO5,PO6
5	Code, debug and test the programs with appropriate test cases	PO7,PO8

Text Book	
1	E. Balagurusamy, Programming in ANSI C, Fifth Edition, Tata McGraw-Hill, 2010.

Reference Books	
1.	Byron Gottfried, Schaum's Outline Programming with C, Fourth Edition, Tata McGraw-Hill, 2018.
2.	Kernighan and Ritchie, The C Programming Language, Second Edition, Prentice Hall, 1998
3.	YashavantKanetkar, Let Us C, Eighteenth Edition, BPB Publications,2021

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

Mapping with Programme Outcomes:

CO/PSO	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
Weightage of course contributed to each PSO	7	10	10	18	15	6

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

TITLE OF THE PAPER: DISCRETE MATHEMATICS

Subject Code	Subject Name	Category	L	T	P	S	Cr	In	Marks

							e d it s	st . H o u r s	CIA	Ext ern al	Total
U23GU58	**DISCRETE MATHEMATICS**	GEC	Y	-	-	-	4	2	25	75	100

Pedagogy	Hours	Lecture	Peer Teaching	GD/VIDOES/TUTORIAL	ICT
	5	5	-	-	-

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		
UNIT 1 CO1: Apply boolean algebra, the language that simplifies communication in the world of computers.	1	15
UNIT 2 CO2: Use formal logic, and will be able to identify interesting outcomes	2	15
UNIT 3 CO3: Implement mathematical structures (sets, relations, functions, sequences, series, graphs) in real world situations.	3	15
UNIT 4 CO4: Summarize principles of counting and will be able to grasp patterns in data that follows fixed set of rules.	4	15
UNIT 5 CO5: Discuss graph concepts.	5	15

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:

 Relations and Functions: Relations – Representation of a relation – Operations on relations – equivalence relation – Closures &Warshalls Algorithm – Partial order Relation – Hasse Diagrams – Lattice.
UNIT III:

Logic: Introduction – IF statements – Connectives – Truth table of a formula – Tautology – Tautological implications and Equivalence of formulae – Quantifiers.

UNIT IV:

Recurrence relations and Generating functions: Recurrence relation – an introduction – Polynomial and their evaluations – Recurrence relations – Solutions of finite order homogeneous (linear) relations – Solutions of non-homogeneous relations – Generating functions (for all the theorem consider the statements without proofs).

UNIT V:

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. 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.   Discrete Mathematics – M.Venkataraman, N.Sridharan and N.Chandrasekaran – The National Publishing Company, May 2009.
2.   Graph Theory with applications to Engineering and Computer Science , NarsinghDeo, Prentice Hall of India Pvt. Limited, 1999
UnitI :Text Book 1 - Chapter 1.1 to 1.8

Unit II: Text Book 1 - Chapter 2 (2.2 to 2.6), 10.1

Unit III: Text Book 1 - Chapter 9 (9.1 to 9.3, 9.6 to 9.8, 9.15)

Unit IV: Text Book 1 - Chapter 5.1 to 5.6

Unit 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)

REFERENCES:

1.   B. Gottfried, "Schaum's Outline of Programming with C", 3rd Edition, Tata McGraw Hill,2010.
2.   J.R. Hanly and E.B. Koffman, "Problem Solving and Program Design in C", 6th Edition,
Pearson Education, 2009.
3.   Programming with ANSI and Turbo C, Ashok N.Kamthane , Pearson Education, 2006
4.   H. Schildt, C: The Complete Reference, 4th Edition, TMH Edition, 2000.
5.   Kanetkar Y., Let us C, BPB Pub., New Delhi, 1999.

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			
	Relations and Functions: Relations – Representation of a relation —.	5	Lecture
	Operations on relations – equivalence relation – Closures &Warshalls Algorithm	5	Lecture
	Partial order Relation – Hasse Diagrams – Lattices	5	Lecture
UNIT III			
	Logic: Introduction – IF statements – Connectives	5	Lecture
	Truth table of a formula – Tautology	5	Lecture
	Tautological implications and Equivalence of formulae – Quantifiers.	5	Lecture
UNIT IV			
	Recurrence relations and Generating functions: Recurrence relation – an introduction – Polynomial and their evaluations —	5	Lecture
	Recurrence relations – Solutions of finite order homogeneous (linear) relations – Solutions of non-homogeneous relations	5	Lecture
	Generating functions (for all the theorem consider the statements without proofs).	5	Lecture
UNIT V			

	Introduction: What is a graph – Application of graphs – Finite and infinite graphs – Incidence and degree	5	Lecture

– 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.									5		Lecture
circuits Treesand fundamental : 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).									5		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	Poo r	Moderat e	High	Very High

Mean Score of COs =   Total of Value   Mean Overall Score of COs = Total of Mean Score

Total No. of Pos & PSOs	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

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	**Introductory concepts:** Memory unit– CPU-Input Devices: Key board, Mouse and Scanner.Outputdevices:Monitor,Printer.IntroductiontoOperatingsystems&itsfeatures:DOS– UNIX–Windows. IntroductiontoProgrammingLanguages.	6
II	**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.	6
III	**Spreadsheets:**Excel–opening,enteringtextanddata,formatting,navigating;Formulas–entering,handlingand copying;Charts–creating,formatting and printing,analysistables,preparationoffinancialstatements,introductiontodata analytics.	6
IV	**Database Concepts:** The concept of data base management system; Data field, records, and files,Sorting and indexing data; Searching records. Designing queries, and reports; Linking of datafiles; Understanding Programming environment in DBMS; Developing menu drive applicationsinquerylanguage(MS–Access).	6
V	**Power point:** Introduction to Power point - Features – Understanding slide typecasting & viewingslides – creating slide shows. Applying special	6

	object – including objects & pictures – Slidetransition–Animationeffects,audioinclusion,timers.		
	Total		**30**

	Course Outcomes	**Programme Outcomes**
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

	Text Book
1	PeterNorton,"IntroductiontoComputers"–TataMcGraw-Hill.

	Reference Books
1.	Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, "Microsoft 2003", Tata McGrawHill.

	Web Resources
1.	https://www.udemy.com/course/office-automation-certificate-course/
2.	https://www.javatpoint.com/automation-tools

Mapping with Programme Outcomes:

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
Weightage of course contributed to each PSO	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	Cre	Ins	Marks

U23CU3	OBJECT ORIENTED PROGRAMMING CONCEPTS USING C++	Core	Y	-	-	-	5	5	25	75	100

| | Credits | Inst. Hours | CIA | External | Total |

Course Objective

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

UNIT	Details	No. of Hours
I	Introduction to C++ - key concepts of Object-Oriented Programming –Advantages – Object Oriented Languages – I/O in C++ - C++ Declarations. Control Structures : - Decision 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
	Total	75

Course Outcomes		Programme Outcome
CO	Upon completion of the course the students would be able to:	
1	Remember the program structure of C with its syntax and semantics	PO1,PO6
2	Understand the programming principles in C (data types, operators, branching and looping, arrays, functions, structures, pointers and files)	PO2

3	Apply the programming principles 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

Text Book

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

Reference Books

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

Web Resources

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

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	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
Weight-age of course contributed to each PSO	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	CIA	External	Total
U23CU4P	C++ PROGRAMMING LAB	Core	-	-	Y	-	3	5	25	75	100

Course Objective

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

S.No	Details	No. of Hours

1	Write a C++ program to demonstrate function overloading, Default Arguments and Inline function.	
2	Write a C++ program to demonstrate Class and Objects	
3	Write a C++ program to demonstrate the concept of Passing Objects to Functions	
4	Write a C++ program to demonstrate the Friend Functions.	
5	Write a C++ program to demonstrate the concept of Passing Objects to Functions	
6	Write a C++ program to demonstrate Constructor and Destructor	
7	Write a C++ program to demonstrate Unary Operator Overloading	
8	Write a C++ program to demonstrate Binary Operator Overloading	
9	Write a C++ program to demonstrate: ● Single Inheritance ● Multilevel Inheritance ● Multiple Inheritance ● Hierarchical Inheritance ● Hybrid Inheritance	
10	Write a C++ program to demonstrate Virtual Functions.	
11	Write a C++ program to manipulate a Text File.	
12	Write a C++ program to perform Sequential I/O Operations on a file.	
13	Write a C++ program to find the Biggest Number using Command Line Arguments	
14	Write a C++ program to demonstrate Class Template	
15	Write a C++ program to demonstrate Function Template.	
16	Write a C++ program to demonstrate Exception Handling.	

Course Outcomes		Programme Outcome
CO	Upon completion of the course the students would be able to:	
1	Remember the program structure of C with its syntax and semantics	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

Text Book	
1	E. Balagurusamy, "Object-Oriented Programming with C++", TMH 2013, 7th Edition.
Reference Books	
1.	Ashok N Kamthane, "Object-Oriented Programming with ANSI and Turbo C++", Pearson Education 2003.
2.	Maria Litvin& Gray Litvin, "C++ for you", Vikas publication 2002.
Web Resources	
1.	https://alison.com/course/introduction-to-c-plus-plus-programming

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	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
Weightage of course contributed to each PSO	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	CIA	External	Total
U23GU68	**DIGITAL LOGIC FUNDAMENTALS**	GEC	-	-	Y	-	4	5	25	75	100

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
UNIT 1 CO1: Define the basic components of a digital computer and their function	1	12
UNIT 2 CO2: Enhance knowledge on simplifying digital circuits.	2	12
UNIT 3 CO3: Apply Boolean algebra in design of gates.	3	12
UNIT 4 CO4: Simplify and solve the logical expressions.	4	12
UNIT 5 CO5: Design various counters.	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 Karanaugh 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
U23GU71P	**MULTIMEDIA LAB**	SEC	-	-	Y	-	2	5	25	75	100

Pedagogy	Hours	PracticalLab	TUTORIAL	ICT
	5	4 -	1	-

PREAMBLE:
1. To manipulate images by various techniques supported by image editingtools.
2. To create 2D animation using guide layer, various tweening methods supported by animationsoftware.
3. To model the object using wireframe and making it to animate andtransform.

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, MoveTool
2. Working with Lasso, Polygonal Lasso tool , Transform and Opacityoptions
3. Working with Quick Select Tool (or Magic Wand Tool), Invert SelectionTool
4. Working with Paint Bucket Tool, Color Picker, BrushTool
5. Working with Layers, EraserTool
6. Working with Text and TransformTool
7. Working with ColorBalance
8. Working with Crop andCanvas
9. Working with Clone Stamp Tool, SmudgeTool
10. Working with Filters ,effects

Macromedia FLASH – (2D Animation):
1. MotionTweening
2. ShapeTweening
3. Working with multipleLayers
4. Animation using guidelayer
5. Animation using MaskingEffect

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	C I A	External	Total
									Marks		
U23SEU10	**Multimedia Systems**	SEC	2	-	-	-	2	2	25	75	100

CourseObjective	
LO1	UnderstandthedefinitionofMultimedia
LO2	TostudyabouttheImageFileFormats,SoundsAudioFileFormats
LO3	UnderstandtheconceptsofAnimationandDigitalVideoContainers
LO4	TostudyabouttheStageofMultimediaProject
LO5	UnderstandtheconceptofOwnershipofContentCreatedforProjectAcquiringTalent

UNIT	Details	No.of Hours
I	Multimedia Definition-Use Of Multimedia-Delivering Multimedia- Text: About Fonts andFaces-UsingTextinMultimedia -Computers andText Font Editing and Design Tools-Hypermedia andHypertext.	6
II	Images:PlanApproach-OrganizeTools-ConfigureComputerWorkspace-MakingStill Images-Color -ImageFileFormats.Sound:ThePowerofSound-DigitalAudio-MidiAudio-Midivs.DigitalAudio-MultimediaSystemSounds Audio File Formats -Vaughan'sLawofMultimediaMinimums-AddingSoundtoMultimediaProject	6
III	Animation:ThePowerofMotion-PrinciplesofAnimation-AnimationbyComputer-MakingAnimationsthatWork. Video: Using Video -WorkingwithVideoandDisplays-DigitalVideoContainers-ObtainingVideoClips-ShootingandEditingVideo	6
IV	Making Multimedia:TheStageof Multimedia Project-The Intangible Needs -The Hardware Needs - The SoftwareNeeds-AnAuthoringSystemsNeeds-Multimedia ProductionTeam.	6

V	Planning andCosting:The ProcessofMakingMultimedia-Scheduling-Estimating-RFP sandBidProposals.Designing and Producing-ContentandTalent:AcquiringContent-OwnershipofContent CreatedforProject-AcquiringTalent		6
	Total		**30**

CourseOutcomes		ProgrammeOutcomes
CO	Oncompletionofthiscourse,studentswill	
1	understand the concepts, importance, application and theprocessof developingmultimedia	PO1
2	tohave basicknowledgeandunderstandingaboutimagerelatedprocessings	PO1,PO2
3	Tounderstand theframeworkofframesand bitimagestoanimations	PO4,PO6
4	Speaksaboutthemultimediaprojectsandstagesofrequirementinphasesofproject.	PO4,PO5,PO6
5	Understanding the concept of cost involved in multimediaplanning,designing,andproducing	PO3,PO8

TextBook	
1	TayVaughan,"Multimedia:MakingItWork",8thEdition,Osborne/McGraw-Hill,2001.

ReferenceBooks	
1.	RalfSteinmetz&KlaraNahrstedt"MultimediaComputing,Communication&Applications",PearsonEducation,2012.

WebResources	
1.	https://www.geeksforgeeks.org/multimedia-systems-with-features-or-characteristics/

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**2**	**3**	**3**	**2**	**1**
CO2	**3**	**2**	**3**	**3**	**2**	**1**
CO3	**3**	**2**	**3**	**3**	**2**	**1**
CO4	**3**	**2**	**3**	**3**	**1**	**1**
CO5	**3**	**3**	**3**	**3**	**1**	**1**
Weightageofcoursecontributedtoeach PSO	15	11	15	15	8	5

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
U23SEU19	**WEB DESIGNING**	Specific Elective	Y	-	-	-	2	2	25	75	100

Course Objective

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
	Total	60	

Course Outcomes		Programme Outcome
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	PO1,PO2,PO3,PO6

	Hypertext Markup Language (HTML).	
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
Text Book		
1	Pankaj Sharma, "Web Technology", SkKataria& Sons Bangalore 2011.	
2	Mike Mcgrath, "Java Script", Dream Tech Press 2006, 1st Edition.	
3	Achyut S Godbole&AtulKahate, "Web Technologies", 2002, 2nd Edition.	
Reference Books		
1.	Laura Lemay, RafeColburn , Jennifer Kyrnin, "Mastering HTML, CSS &Javascript Web Publishing", 2016.	
2.	DT Editorial Services (Author), "HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)", Paperback 2016, 2nd Edition.	
Web Resources		
1.	NPTEL & MOOC courses titled Web Design and Development.	
2.	https://www.geeksforgeeks.org	

Mapping with Programme Outcomes:

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
Weightage of course contributed to each PSO	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	Marks		
									CIA	External	Total
U23CU5	DATA STRUCTURES AND ALGORITHMS	Core	Y	-	-	-	4	5	25	75	100

	Course Objective	
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 strutures and and application of graphs	
LO5	To understand various sorting and searching	
UNIT	**Details**	**No. of Hours**
I	Abstract Data Types (ADTs)- List ADT-array-based implementation-linked list implementation singly linked lists-circular linked lists-doubly-linked lists-applications of lists-Polynomial Manipulation- All operations-Insertion-Deletion-Merge-Traversal	15
II	Stack ADT-Operations- Applications- Evaluating arithmetic expressions – Conversion of infix to 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-Shellsort-Radix sort-Hashing-Hash functions-Separate chaining- Open Addressing-RehashingExtendible Hashing	15
	Total	**75**

	Course Outcomes	Programmeme Outcome
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
	Text Book	

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

	Reference Books
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

	Web Resources
1.	NPTEL & MOOC courses titled Data Structures
2.	https://nptel.ac.in/courses/106106127/

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	-	-	-
Weightage of course contributed to each PSO	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	Marks		
									CIA	External	Total
U23CU6P	DATA STRUCTURES AND ALGORITHMS LAB using C++	Core	-	-	Y	-	3	4	25	75	100
		Course Objective									

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 strutures and and application of graphs	
LO5	To understand various sorting and searching	
Sl. No	**Details**	**No. of Hours**
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. ● Stack ADT ● Queue ADT	
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: ● Insert an element into a binary search tree. ● Delete an element from a binary search tree. ● Search for a key element in a binary search tree.	
6.	Write a program to perform the following operations ● Insertion into an AVL-tree ● Deletion from an AVL-tree	
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: ● Linear search ● Binary search.	

9.	Write a programs for implementing the following sorting methods: ● Bubble sort ● Selection sort ● Insertion sort ● Radix sort.		
	Total		

	Course Outcomes	Programmem Outcome
CO	On completion of this course, students will	
1	Understand the concept of Dynamic memory management, data types, algorithms, Big O notation	PO1,PO4,PO5
2	Understand basic data structures such as arrays, linked lists, stacks and queues	PO1, PO4,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
Text Book		
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	
Reference Books		
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	
Web Resources		
1.	NPTEL & MOOC courses titled Data Structures	
2.	https://nptel.ac.in/courses/106106127/	

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	-	-	-
Weightage of course contributed to each PSO	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	Marks CIA	External	Total
U23GU72	**Database Management System**	GEC	Y	-	-	-	4	5	25	75	100

Course Objective	
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
	Database Concepts: Database Systems - Data vs Information - Introducing the database -File system - Problems with file system – Database systems. Data models - Importance - Basic Building Blocks - Business rules - Evolution of Data models - Degrees of Data Abstraction	15	CO1
II	**Design Concepts:** Relational database model - logical view of data-keys -Integrity rules - relational set	15	CO2

	operators - data dictionary and the system catalog - relationships -data redundancy revisited -indexes - codd's rules. Entity relationship model - ER diagram		
III	**Normalization of Database Tables**: Database tables and Normalization – The Need for Normalization –The Normalization Process – Higher level Normal Form. **Introduction to SQL**: Data Definition Commands – Data Manipulation Commands – SELECT Queries – Additional Data Definition Commands – Additional SELECT Query Keywords – Joining Database Tables.	15	CO3
IV	**Advanced SQL**:Relational SET Operators: UNION – UNION ALL – INTERSECT - MINUS.SQL Join Operators: Cross Join – Natural Join – Join USING Clause – JOIN ON Clause – Outer Join.**Sub Queries and Correlated Queries**: WHERE – IN – HAVING – ANY and ALL – FROM. SQL Functions: Date and Time Function – Numeric Function – String Function – Conversion Function	15	CO4
V	**PL/SQL**:A Programming Language: History – Fundamentals – Block Structure – Comments – Data Types – Other Data Types – Variable Declaration – Assignment operation –Arithmetic operators.**Control Structures and Embedded SQL**: Control Structures – Nested Blocks – SQL in PL/SQL – Data Manipulation – Transaction Control statements. **PL/SQL Cursors and Exceptions**: Cursors – Implicit Cursors, Explicit Cursors and Attributes – Cursor FOR loops – SELECT…FOR UPDATE – WHERE CURRENT OF clause – Cursor with Parameters – Cursor Variables – Exceptions – Types of Exceptions.	15	CO5
	Total	**75**	
	Course Outcomes	**Programme Outcomes**	
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	PO4, PO5, PO6	

	operations and enhance the knowledge of handling multiple tables.	
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
	Text Book	
1	Coronel, Morris, Rob, "Database Systems, Design, Implementation and Management", Ninth Edition	
2	Nilesh Shah, "Database Systems Using Oracle", 2nd edition, Pearson Education India, 2016	
	Reference Books	
1.	Abraham Silberschatz, Henry F.Korth and S.Sudarshan,"Database System Concepts", McGraw Hill International Publication ,VI Edition	
2.	Shio Kumar Singh , "Database Systems ",Pearson publications ,II Edition	
	Web Resources	
1.	Web resources from NDL Library, E-content from open-source libraries	

Mapping with Programme Outcomes:

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

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

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

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		Inst. Hours	Marks		
										External	Total
U23SEU15	**Enterprise Resource Planning**	SEC	2	-	-	-	2	2	25	75	100
Course Objectives											
LO1	Tounderstandthebasicconcepts,EvolutionandBenefitsofERP.										
LO2	Toknowthe needandRoleofERPinlogicalandPhysicalIntegration.										
LO3	Identifytheimportantbusiness functionsprovidedbytypicalbusinesssoftwaresuch asenterpriseresourceplanningandcustomerrelationshipmanagement										

UNIT	Details	No. ofHours
	Totrainthestudentstodevelopthebasicunderstandingofhow ERPenrichesthe businessorganizationsinachievingamultidimensionalgrowth	
LO4		
LO5	Toaimatpreparingthestudentstechnologicalcompetitiveandmakethemreadyto self-upgrade withthehighertechnicalskills	
I	ERP Introduction, Benefits, Origin, Evolution and Structure:ConceptualModelofERP,theEvolutionofERP,theStr uctureofERP,ComponentsandneedsofERP,ERP Vendors;Benefits&LimitationsofERPPackages.	6
II	Need to focus on Enterprise Integration/ERP; Informationmapping;RoleofcommonsharedEnterprisedataba se;System Integration, Logical vs. Physical System Integration,Benefits & limitations of System Integration, ERP's Role inLogicalandPhysicalIntegration.BusinessProcessReenginee ring,DatawareHousing,DataMining,OnlineAnalyticProcessin g(OLAP),ProductLifeCycleMan- agement(PLM),LAP,SupplychainManagement.	6
III	ERPMarketplaceandMarketplaceDynamics:MarketOvervie w,MarketplaceDynamics,theChangingERPMarket. ERP- Functional Modules: Introduction, FunctionalModules of ERP Software, Integration of ERP, Supply chainand Customer Relationship Applications. Cloud and OpenSource,QualityManagement,MaterialManagement, FinancialModule,CRMandCaseStudy.	6
IV	ERPImplementationBasics,,ERPimplementationStrategy,ER PImplementationLifeCycle,Pre-Implementationtask,RoleofS DLC/SSAD,ObjectOriented Architecture,Consultants, VendorsandEmployees.	6
V	ERP&E-Commerce,FutureDirectives-inERP,ERPand	6

	Internet,Criticalsuccessandfailurefactors,IntegratingERP intoor-ganizationalculture.UsingERPtool:eitherSAPorORACLEformattocasestudy.	
	Total	**30**

CourseOutcomes		
Course Outcomes	Oncompletionofthiscourse,studentswill;	
CO1	UnderstandthebasicconceptsofERP.	PO1,PO2,PO6
CO2	IdentifydifferenttechnologiesusedinERP	PO2,PO3,PO8
CO3	UnderstandandapplytheconceptsofERP Manufacturing PerspectiveandERP Modules	PO1,PO3,PO7
CO4	Discussthebenefitsof ERP	PO2,PO6
CO5	ApplydifferenttoolsusedinERP	PO1,PO3,PO8

ReferenceText:	
1.	EnterpriseResourcePlanning–AlexisLeon,TataMcGrawHill.

References:	
1.	Enterprise ResourcePlanning–DiversifiedbyAlexisLeon,TMH.
2.	EnterpriseResourcePlanning–RaviShankar&S.Jaiswal,Galgotia

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

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

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) CATOLOGUE 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	Credits	Inst. Hours	Marks		
									CIA	External	Total
U23CU7	**Programming IN JAVA**	Core	Y	-	-	-	4	5	25	75	100
Course Objectives											
LO1	To provide fundamental knowledge of object-oriented programming										
LO2	To equip the student with programming knowledge in Core Java from the basics up.										
LO3	To enable the students to use AWT controls, Event Handling and Swing for GUI.										
LO4	To provide fundamental knowledge of object-oriented programming.										
LO5	To equip the student with programming knowledge in Core Java from the basics up.										

UNIT	Details	No. of Hours	Course Objectives
I	**Introduction:**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	**Inheritance**: Basic concepts - Types of inheritance - Member access rules - Usage of this and Super key word - Method Overloading - Method overriding - Abstract classes - Dynamic method dispatch - Usage of final keyword. **Packages**:Definition-AccessProtection -ImportingPackages. **Interfaces**:Definition–Implementation–Extending Interfaces. **Exception Handling**: *try – catch - throw - throws – finally* – Built-inexceptions - Creating own Exception classes.	15	CO2
III	**Multithreaded Programming**: Thread Class - Runnable interface –Synchronization–Using synchronizedmethods– Using synchronized statement-InterthreadCommunication –Deadlock. **I/O Streams:** Concepts of streams - Stream classes- Byte and Character stream - Reading console Input and Writing Console output - File Handling.	15	CO3
IV	**AWT Controls:** The AWT class hierarchy - user interface components- Labels - Button - Text Components - Check Box - Check Box Group - Choice - List Box - Panels – Scroll Pane - Menu - Scroll Bar. Working with Frame class - Colour - Fonts and layout managers.	15	CO4

	Event Handling: Events - Event sources - Event Listeners - Event Delegation Model (EDM) - Handling Mouse and Keyboard Events - Adapter classes - Inner classes		
V	Swing: 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.	15	CO5
	Total	**75**	
Course Outcomes
Course Outcomes	On completion of this course, students will;		
CO1	Understand the basic Object-oriented concepts.Implement the basic constructs of Core Java.	PO1, PO2, PO6	
CO2	Implement inheritance, packages, interfaces and exception handling of Core Java.	PO2, PO3, PO8	
CO3	Implement multi-threading and I/O Streams of Core Java	PO1, PO3, PO7	
CO4	Implement AWT and Event handling.	PO2, PO6	
CO5	Use Swing to create GUI.	PO1, PO3, PO8	
Text Books:
1.	Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010		
2.	Gary Cornell, *Core Java 2 Volume I – Fundamentals,* Addison Wesley, 1999		
References :
1.	Head First Java, O'Rielly Publications,		
2.	**Y. Daniel Liang, *Introduction to Java Programming*, 7th Edition, Pearson Education India, 2010**		
Web Resources

1.	https://javabeginnerstutorial.com/core-java-tutorial
2.	http://docs.oracle.com/javase/tutorial/
3.	https://www.coursera.org/

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
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
Weightage of course contributed to each PSO	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
U23CU8P	**Programming in java lab**	Core	-	-	y	-	3	4	25	75	100
Course Objective											
LO1	To provide fundamental knowledge of object-oriented programming.										
LO2	To equip the student with programming knowledge in Core Java from the basics up.										

UNIT	Details	
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.	
UNIT	**Details**	
1	Write a Java program that prompts the user for an integer and then prints out all the prime numbers up to that Integer	
2	Write a Java program to multiply two given matrices.	
3	Write a Java program that displays the number of characters, lines and words in a text	
4	Generate random numbers between two given limits using Random class and print messages according to the range of the value generated.	
5	Write a program to do String Manipulation using 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 c. To extract substring from given string	
7	Write a program to perform string operations using String Buffer class: a. Length of a string b. Reverse a string c. Delete a substring from the given string	

8	Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.	
9	Write a threading program which uses the same method asynchronously to print the numbers 1to10 using Thread1 and to print 90 to100 using Thread2.	
10	Write a program to demonstrate the use of following exceptions. a. Arithmetic Exception b. Number Format Exception c. ArrayIndexOutofBoundException d. 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.	
Total		**60**

Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
1	Understand the basic Object-oriented concepts.Implement the basic constructs of Core Java.	PO1
2	Implement inheritance, packages, interfaces and exception handling of Core Java.	PO1, PO2
3	Implement multi-threading and I/O Streams of Core Java	PO4, PO6
4	Implement AWT and Event handling.	PO4, PO5, PO6
5	Use Swing to create GUI.	PO3, PO8

Text Book	
1	Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010.
2.	Gary Cornell, *Core Java 2 Volume I – Fundamentals,* Addison Wesley, 1999.

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

Web Resources	
1.	https://www.w3schools.com/java/
2.	http://java.sun.com

3.	http://www.afu.com/javafaq.html

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
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
Weightage of course contributed to each PSO	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
U23GU73	**Artificial Intelligence**	GEC	-	Y	-	-	4	5	25	75	100

Course Objective	
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
	Total	**75**

Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
1	Understand the various concepts of AI Techniques.	PO1
2	Understand various Search Algorithm in AI.	PO1, PO2
3	Understand probabilistic reasoning and models in AI.	PO4, PO6
4	Understand Markov Decision Process.	PO4, PO5, PO6
5	Understand various type of Reinforcement learning Techniques.	PO3, PO8
Text Book		
1	Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach" , 3rd Edition, Prentice Hall.	

	Elaine Rich and Kevin Knight, "Artifical Intelligence", Tata McGraw Hill
	Reference Books
1.	**Trivedi, M.C., "A Classical Approach to Artifical 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**
	Web Resources
1.	NPTEL&MOOCcoursestitledArtificialIntelligenceandExpertSystems
2.	https://nptel.ac.in/courses/106106140/
3.	https://nptel.ac.in/courses/106106126/

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**
Weightage of course contributed to each PSO	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
U23SEU20	**Software Engineering**	SEC	Y	-	-	-	4	5	25	75	100

Course Objectives	
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	**Introduction**: 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. **Software Life Cycle Models**: Why use a life cycle model, Classical waterfall model, iterative waterfall model, prototyping model, evolutionary model, spiral model, comparison of different life cycle models.	12	CO1
II	**Requirements Analysis and Specification:** Requirements gathering and analysis, Software requirements specification (SRS) **Software Design**: Good software design, cohesion and coupling, neat arrangement, software design approaches, object- oriented vs function-oriented design	12	CO2
III	**Function-Oriented Software Design:** Overview of SA/SD methodology, structured analysis, data flow diagrams (DFD's), structured design, detailed design.**User-Interface design:** Characteristics of a good interface; basic concepts; types of user interfaces;	12	CO3

	component based GUI development, a user interface methodology.		
IV	**Coding and Testing:** 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.**Software Reliability and Quality Management:** Software reliability; statistical testing; software quality; software quality management system; SEI capability maturity model; personal software process.	12	CO4
V	**Computer Aided Software Engineering:** 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. **Software Maintenance:** Characteristic of software maintenance; software reverse engineering; software maintenance process models; estimation of maintenance cost;	12	CO5
	Total	**60**	
	Course Outcomes		
Course Outcomes	On completion of this course, students will;		
CO1	Gain basic knowledge of analysis and design of systems	PO1	
CO2	Ability to apply software engineering principles and techniques	PO1, PO2	
CO3	Model a reliable and cost-effective software system	PO4, PO6	
CO4	Ability to design an effective model of the system	PO4, PO5, PO6	

CO5	Perform Testing at various levels and produce an efficient system.	PO3, PO8
Text Books		
1.	Rajib Mall, Fundamentals of Software Engineering, Fifth Edition, Prentice-Hall of India, 2018	
References Books		
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:

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
CO 4	3	-	2	2	-	1
CO 5	1	2	3	3	1	1
Weightage of course contributed to each PSO	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. Hou	Marks

								r s	C I A	E x t e r n a l	Tot al
U23SEU9	**Image Processing**	SEC	-	Y	-	-	3	5	25	75	100

<table>
<tr><td colspan="12" align="center">Course Objective</td></tr>
</table>

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	**Digital Image Fundamentals:** 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 of image- Compression schemes- Huffman coding-Arithmetic coding- Dictionary based compression -Transform based compression,	15
	Total	**75**

Course Outcomes		Programme Outcome
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

Text Book	
1	S Jayaraman, S Esakkirajan, T Veerakumar, Digital image processing ,Tata McGraw Hill, 2015
2	Gonzalez Rafel C, Digital Image Processing, Pearson Education, 2009

Reference Books	
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

Web Resources	
1.	https://kanchiuniv.ac.in/coursematerials/Digital%20image%20processing%20-Vijaya%20Raghavan.pdf
2.	http://sdeuoc.ac.in/sites/default/files/sde_videos/Digital%20Image%20Processing%20 3rd%20ed.%20-%20R.%20Gonzalez%2C%20R.%20Woods-ilovepdf-compressed.pdf
3.	https://dl.acm.org/doi/10.5555/559707
4.	https://www.ijert.org/image-processing-using-web-2-0-2

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
Weightage of course contributed to each PSO	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

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

UNIT	Details	No. of Hours	Course Objective

	Introduction: operating system, history (1990s to 2000 and beyond), distributed computing, parallel computation. **Process concepts:** definition of process, process states-Life cycle of a process, process management- process state transitions, process control block(PCB), process operations , suspend and resume, context switching, Interrupts -Interrupt processing, interrupt classes, Inter process communication-signals, message passing.	15	CO1	
II	**Asynchronous concurrent processes:** mutual exclusion- critical section, mutual exclusion primitives, implementing mutual exclusion primitives, Peterson's algorithm,software solutions to the mutual Exclusion Problem-, n-thread mutual exclusion- Lamports Bakery Algorithm. Semaphores – Mutual exclusion with Semaphores, thread synchronization with semaphores, counting semaphores, implementing semaphores. **Concurrent programming:** monitors, message passing	15	CO2	
III	**Deadlock and indefinite postponement:** Resource concepts, four necessary conditions for deadlock, deadlock prevention, deadlock avoidance and Dijkstra's Banker's algorithm, deadlock detection, deadlock recovery.	15	CO3	
IV	**Job and processor scheduling:** scheduling levels, scheduling objectives, scheduling criteria, preemptive vs non-preemptive scheduling, interval timer or interrupting clock, priorities, scheduling algorithms-FIFO scheduling, RR scheduling, quantum size, SJF	15	CO4	

		scheduling, SRT scheduling, HRN scheduling, multilevel feedback queues, Fair share scheduling.		
V		**Real Memory organization and Management**:: Memory organization, Memory management, Memory hierarchy, Memory management strategies, contiguous vs non-contiguous memory allocation, single user contiguous memory allocation, fixed partition multiprogramming, variable partition multiprogramming, Memory swapping **Virtual Memory organization:** virtual memory basic concepts, multilevel storage organization, block mapping, paging basic concepts, segmentation, paging/segmentation systems. **Virtual Memory Management:** Demand Paging, Page replacement strategies	15	CO5
		Total	**75**	

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

| 4 | Have complete knowledge of Scheduling Algorithms and its types. | PO4, PO5, PO6 |
| 5 | understand memory organization and management | PO3, PO8 |

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

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

Web Resources	
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
Weightage of course contributed to each PSO	12	8	4	11	5	6

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
U23CU10	**ASP .Net Programming**	Core	Y	-	-	-	5	5	25	75	100

<table>
<tr><td colspan="4" align="center">Course Objective</td></tr>
</table>

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.

UNIT	Details	No. of Hours	Course Objective
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
	Total	**60**	

Course Outcomes		Programme Outcome
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

Text Book	
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.

Reference Books	
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.

Web Resources	
1.	https://www.geeksforgeeks.org/introduction-to-net-framework/
2.	https://www.javatpoint.com/net-framework

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
Weightage of course contributed to each PSO	15	8	10	10	8	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
U23CU11P	ASP.Net Programming LAB	Core	-	-	Y	-	3	4	25	75	100

Course Objective	
LO1	To develop ASP.NET Web application using standardcontrols.
LO2	To create rich database applications usingADO.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 Objectvie
1.	Create an exposure of Web applications and tools		
2.	Implement the Html Controls		
3.	Implement the Server Controls		C1
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 Fileconcepts.		
1.	Web application using Data Controls.		C2
2.	Data binding with Web controls		
3.	Data binding with Data Controls.		
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.		C3
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		
	Total		

Course Outcomes		Programme Outcome
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

	Text Book	
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.	

	Reference Books
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.

	Web Resources
1.	https://www.geeksforgeeks.org/introduction-to-net-framework/
2.	https://www.javatpoint.com/net-framework

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
CO 5	3	2	2	2	1	2
Weightage of course contributed to each PSO	15	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
U23DU08	Open Source Software Technologies	DSEC	C	-	-	-	3	2	25	75	100

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

UNIT	Details	No. of Hours	CO
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	**UNIT IV: MySQL:** 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	● **Introduction** –PHP Form processing – Database Access with PHP – MySQL, MySQL Functions – Inserting Records – Selecting Records – Deleting Records – Update Records.	6	C6
	Total		**30**

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

Text Book	
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.

Reference Books	
1.	Eric Rosebrock, Eric Filson, "Setting up LAMP: Getting Linux, Apache, MySQL and PHP and working together", John Wiley and Sons, 2004.
2.	2. Anthony Butcher , "Teach Yourself MySQL in 21 days", 2nd Edition, Sams Publication.
3.	3. Rich Bower, Daniel Lopez Ridreejo, Alian Liska , "Apache Administrator's Handbook", Sams Publication.

4.	4. Tammy Fox, "RedHat Enterprise Linux 5 Administration Unleashed", Sams Publication.
5.	5. Naramore Eligabette, Gerner Jason, Wrox Press, Wiley Dreamtech Press, "Beginning PHP5, Apache, MySQL Web Development", 2005.
Web Resources	
1.	Introduction to Open-Source and its benefits - GeeksforGeeks
2.	https://www.bing.com/

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	1	3	2	2	1	1
CO 2	3	1	3	2	3	3
CO 3	3	2	2	-	2	1
CO 4	2	-	3	3	3	1
CO 5	3	3	3	3	3	2
Weightage of course contributed to each PSO	12	9	13	10	12	8

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
U23DU19	**Data Mining And Warehousing**	DSEC	Y	-	-	-	3	2	25	75	100

Course Objectives	
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 Warehouses.	15	CO3
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, Petitioning Methods –	15	CO5

	Hierarchical Methods-Density Based Methods – GRID Based Method – Model based Clustering Method		
	Total	**75**	

Course Outcomes

Course Outcomes	On completion of this course, students will;	
CO1	To understand the basic concepts and the functionality of the various data mining and data warehousing component	PO1, PO3, PO6, PO8
CO2	To know the concepts of Data mining system architectures	PO1,PO2,PO3,PO6
CO3	To analyze the principles of association rules	PO3, PO5
CO4	To get analytical idea on Classification and prediction methods	PO1, PO2, PO3, PO7
CO5	To Gain knowledge on Cluster analysis and its methods.	PO2, PO6, PO7

Text Books

(Latest Editions)

1.	Han and M. Kamber, "Data Mining Concepts and Techniques", 2001, Harcourt India Pvt. Ltd, New Delhi.

References Books

(Latest editions)

1.	**K.P. Soman, ShyamDiwakar, V. Ajay "Insight into Data Mining Theory and Practice ",Prentice Hall of India Pvt. Ltd, New Delhi**
2.	**Parteek Bhatia, 'Data Mining and Data Warehousing: Principles and Practical Techniques', Cambridge University Press, 2019**

Web Resources

1.	https://www.topcoder.com/thrive/articles/data-warehousing-and-data-mining#:~:text=Data%20warehousing%20is%20a%20method,compiled%20in%20the%20data%20warehouse.

2.	https://www.javatpoint.com/data-mining-cluster-vs-data-warehousing
3.	https://www.tutorialspoint.com/Data-Warehousing-and-Data-Mining

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
Weightage of course contributed to each PSO	12	14	10	15	9	11

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	Marks External	Total
U23CU13	**Computer Networks**	CORE	-	Y	-	-	5	5	25	75	100

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

	Course Outcomes	Programme Outcome
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 protocols such as FTP, HTTP, Telnet, DNS	PO3, PO8

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

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

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

Mapping with Programme Outcomes:

CO/PSO	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	-
Weightage of course contributed to each PSO	15	8	1	10	5	2

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	CIA	External	Total
									Marks		
									CIA	External	Total
U23CU14	**DATA ANALYTICS USING R Programming**	Core	Y	-	-	-	5	6	25	75	100

<div align="center">Course Objective</div>

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,	18	C2

	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		
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
	Total	**90**	

	Course Outcomes	Programme Outcomes
CO	On completion of this course, students will	
1	Work with big data tools and its analysis techniques.	PO1
2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO2
3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO4, PO6
4	Perform analytics on data streams.	PO4, PO5, PO6
5	Learn NoSQL databases and management.	PO3, PO8
Text Book		
1	Roger D. Peng,” R Programming for Data Science “, 2012	
2	Norman Matloff,”The Art of R Programming- A Tour of Statistical Software Design”, 2011	
Reference Books		
1.	1. Garrett Grolemund, Hadley Wickham,”Hands-On Programming with R: Write Your Own Functions and Simulations” , 1st Edition, 2014	
2.	Venables , W.N.,and Ripley,”S programming“, Springer, 2000.	
Web Resources		
1.	https://www.simplilearn.com	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
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
Weightage of course contributed to each PSO	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	Marks		
									CIA	External	Total
U23CU15P	**R Programming - LAB**	Core	-	-	Y	-	3	5	25	75	100

Course Objective	
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.
Sl. No	**Details**
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	**Write a R program to count the number of even and odd numbers from array of N numbers.**	
	Total	

	Course Outcomes	Programe Outcome
CO	On completion of this course, students will	
1	Acquire programming skills in core R Programming	PO1,PO4,PO5
2	Acquire Object-oriented programming skills in R Programming.	PO1, PO4,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

	Text Book
1	Roger D. Peng," R Programming for Data Science ", 2012
2	Norman Matloff,"The Art of R Programming- A Tour of Statistical Software Design", 2011
	Reference Books
1	Garrett Grolemund, Hadley Wickham,"Hands-On Programming with R: Write Your Own Functions and Simulations" , 1st Edition, 2014
2.	Venables , W.N.,and Ripley,"S programming", Springer, 2000.
	Web Resources
1.	https://www.simplilearn.com

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
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
Weightage of course contributed to each PSO	11	15	15	15	5	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
U23DU18P	PHP PROGRAMMING	DSEC	Y				2	2	25	75	100

Course Objective	
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
	Total		30

Course Outcomes		Programme Outcomes
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.

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

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
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**
Weightage of course contributed to each PSO	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.Hou	Marks		
									CIA	External	Total

U23DU15	Cloud Computing	Elective	-	Y	-	-	3	4	25	75	100

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

UNIT	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. 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	Cloud Services Compute Services: Amazon Elastic Computer Cloud - Google Compute Engine - Windows Azure Virtual Machines Storage Services: Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage Database Services: Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database - Windows Azure Table Service Application Services: Application Runtimes and Frameworks - Queuing Services - Email Services - Notifiction Services - Media Services Content Delivery Services: Amazon CloudFront - Windows Azure Content Delivery Network Analytics Services: Amazon Elastic MapReduce - Google MapReduce Service - Google BigQuery - Windows Azure HDInsight Deployment and Management Services: Amazon Elastic Beanstack - Amazon CloudFormation Identity and Access Management Services: Amazon Identiy and Access Management - Windows Azure Active Directory Open Source Private Cloud Software: CloudStack – Eucalyptus - OpenStack	15
III	**Cloud Application Design:** Introduction – Design Consideration for Cloud Applications – Scalability – Reliability and Availability – Security – Maintenance and Upgradation – Performance – Reference Architectures for Cloud Applications – Cloud Application Design Methodologies: Service Oriented Architecture (SOA), Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller (MVC), RESTful Web Services – Data Storage Approaches: Relational Approach (SQL), Non-Relational Approach (NoSQL).	15
IV	**Cloud Application Benchmarking and Tuning:** Introduction to Benchmarking – Steps in Benchmarking – Workload Characteristics – Application Performance Metrics – Design Consideration for Benchmarking Methodology – Benchmarking Tools and Types of Tests – Deployment Prototyping. **Cloud Security:** 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.	15

V	**Case Studies:** Cloud Computing for Healthcare – Cloud Computing for Energy Systems - Cloud Computing for Transportation Systems - Cloud Computing for Manufacturing Industry - Cloud Computing for Education.	15
	Total	**75**

Course Outcomes		Programme Outcome
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

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

	Reference Books
1.	Anthony T Velte, Toby J Velte, Robert Elsenpeter, *Cloud Computing: A Practical Approach*, Tata McGraw-Hill, 2013.
2.	Barrie Sosinsky, *Cloud Computing Bible*, Wiley India Pvt. Ltd., 2013.
3.	David Crookes, *Cloud Computing in Easy Steps*, Tata McGraw Hill, 2015.
4.	Dr. Kumar Saurabh, *Cloud Computing*, Wiley India, Second Edition 2012.

	Web Resources
1.	https://en.wikipedia.org/wiki/Cloud_computing
2.	https://link.springer.com/chapter/10.1007/978-3-030-34957-8_7

3.	https://webobjects.cdw.com/webobjects/media/pdf/solutions/cloud-computing/121838-CDW-Cloud-Computing-Reference-Guide.pdf

Mapping with Programme Outcomes:

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

2023 – 2024 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.	**U23GU69**	Numerical Methods	
13.	**U23GU70**	Resource Management Techniques	
14.	**U23GU71P**	Multimedia Lab	GEC 2
15.	**U23GU72**	Database Management System	GEC 4
16.	**U23GU73**	Artificial Intelligence	GEC 6
17.,	**U23GU74P**	RDBMS Lab	GEC 5

Skill Enhancement Course

S.No	Sub code	Name of the Skill Enhancement Elective Course	Opted
1.	**U23SEU1**	Fundamentals of Information Technology	
2.	**U23SEU2**	Introduction to HTML	
3	**U23SEU3p**	Web Designing lab	SEC 5
4.	**U23SEU4**	Software Testing	
5.	**U23SEU5**	Problem Solving Techniques	
6.	**U23SEU6**	Understanding Internet	
7.	**U23SEU7**	Office Automation	SEC 1
8.	**U23SEU8**	Quantitative Aptitude	
9.	**U23SEU9**	Image processing	SEC 3
10.	**U23SEU10**	Multimedia Systems	SEC 2

11.	**U23SEU11**	Advanced Excel	
12.	**U23SEU12**	Biometrics	
13.	**U23SEU13**	Cyber Forensics	
14.	**U23SEU14**	Pattern Recognition	
15.	**U23SEU15**	Enterprise Resource Planning	SEC 7
16.	**U23SEU16**	Robotics and Applications	
17.,	**U23SEU17**	Simulation and Modelling	
18.	**U23SEU18**	Organization Behavior	
19.	**U23SEU19**	Web design	SEC 4
20.	**U23SEU20**	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	CIA	External	Total
	Microprocessor and Microcontroller	C	-	-	-		4	5	25	75	100

Course Objective	
LO1	To introduce the internal organization of Intel 8085 Microprocessor.
LO2	To know about various instruction sets and classifictions
LO3	To enable the students to write assembly language programs using 8085.
LO4	To interface the peripheral devices to 8085 using Interrrupt controller and DMA interface.
LO5	To provide real-life applications using microcontroller.

UNIT	Details	No. of Hours	CO

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 Interrupt Controller-Direct Memory Access (DMA) and 8257 DMA controller.	15	C4
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
	Total	**60**	

	Course Outcomes	**Programmeme Outcomea**
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

Text Book	
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].

Reference Books	
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

Web Resources	
1.	Web resources from NDL Library, E-content from open source libraries
2.	https://www.bing.com/

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	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
Weightage of course contributed to each PSO	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
	Microprocessor and microcontroller Lab		C	-	-	-	4	4	25	75	100
Course Objective											
LO1	To introduce the internal organization of Intel 8085 Microprocessor.										
LO2	To know about various instruction sets and classifictions										
LO3	To enable the students to write assembly language programs using 8085.										
LO4	To interface the peripheral devices to 8085 using Interrrupt controller and DMA interface.										
LO5	To provide real-life applications using microcontroller.										
	Details									**No. of Hours**	**CO**

	List of Exercises:		

	Addition and Subtraction
	
	  1. 8 - bit addition
	
	  2. 16 - bit addition
	
	  3. 8 - bit subtraction
	
	  4. BCD subtraction
	
	II. Multiplication and Division
	
	  1. 8 - bit multiplication
	
	  2. BCD multiplication
	
	  3. 8 - bit division
	
	III. Sorting and Searching
	
	  1. Searching for an element in an array.
	
	  2. Sorting in Ascending and Descending order.
	
	  3. Finding the largest and smallest elements in an array.
	
	  4. Reversing array elements.
	
	  5. Block move.
	
	IV. Code Conversion
	
	  1. BCD to Hex and Hex to BCD
	
	  2. Binary to ASCII and ASCII to binary
	
	  3. ASCII to BCD and BCD to ASCII
	
	V. Simple programs on 8051 Microcontroller
	
	  1. Addition
	
	  2. Subtraction
	
	  3. Multiplication
	
	  4. Division
	
	  5. Interfacing Experiments using 8051
	
	    I. Realisation of Boolean Expression through ports.
	
	    II. Time delay generation using subroutines.
	
	    III. Display LEDs through ports		

	Total	30
	Course Outcomes	**Programmeme Outcomea**
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
	Text Book	
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].	
	Reference Books	
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	
Web Resources		
1.	Web resources from NDL Library, E-content from open source libraries	
2.	https://www.bing.com/	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	**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**
Weightage of course contributed to each PSO	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
	RDBMS with PL\SQL	Elective	-	Y	-	-	4	5	25	75	100
Course Objective											
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	
UNIT	**Details**	**No. of Hours**
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
	Total	**75**
	Course Outcomes	**Programme Outcome**
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
	Text Book	

1	TEXT BOOK: 1. S. Sumathi, S. Esakkirajan, "Fundamentals of Relational Database Management System", Springer International Edition 2007.

Reference Books	
1.	REFERENCE BOOKS:
2.	1. Abraham Silberchatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGrawHill 2019, 7th Edition.
3.	2. Alexis Leon & Mathews Leon, "Fundamentals of DBMS", Vijay Nicole Publications 2014, 2nd Edition.

Web Resources	
1.	NPTEL & MOOC courses titled Relational Database Management Systems
2.	https://nptel.ac.in/courses/106106093/
3.	https://nptel.ac.in/courses/106106095/

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
Weightage of course contributed to each PSO	12	6	5	9	6	6

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

Subject Code	Subject Name	Category	L	T	P	S	Credi	Inst.	Marks

							ts	Hours	CIA	External	Total
	PL/SQL Lab	Core	Y	-	-	-	4	4	25	75	100

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

	List of Exercises:	**No. of Hours**	**Course Objective**

II	*I. SQL*
	
	  1. DDLCOMMANDS
	
	  2. DMLCOMMANDS
	
	  3. TCLCOMMANDS
	
	II. PL/SQL
	
	  4. FIBONACCI SERIES
	
	  5. FACTORIAL
	
	  6. STRING REVERSE
	
	  7. SUM OF SERIES
	
	  8. TRIGGER		

	III. CURSOR
	
	   9. STUDENT MARK ANALYSIS USING CURSOR
	
	IV. APPLICATION
	
	   10. LIBRARY MANAGEMENTSYSTEM
	
	   11. STUDENT MARK ANALYSIS			

	Total			

Course Outcomes		Programme Outcomes
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
Text Book		
1	Coronel, Morris, Rob, "Database Systems, Design, Implementation and Management", Ninth Edition	

2	Nilesh Shah, "Database Systems Using Oracle", 2nd edition, Pearson Education India, 2016
Reference Books	
1.	Abraham Silberschatz, Henry F.Korth and S.Sudarshan,"Database System Concepts", McGraw Hill International Publication ,VI Edition
2.	Shio Kumar Singh , "Database Systems ",Pearson publications ,II Edition
Web Resources	
1.	Web resources from NDL Library, E-content from open-source libraries

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
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	2	2	3	1	2
CO 5	2	3	3	3	1	2
Weightage of course contributed to each PSO	11	14	14	15	5	10

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	CIA	External	Total
	Software Engineering	Core	Y	-	-	-	4	5	25	75	100

Course Objectives	
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	**Introduction**: 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. **Software Life Cycle Models**: Why use a life cycle model, Classical waterfall model, iterative waterfall model, prototyping model, evolutionary model, spiral model, comparison of different life cycle models.	12	CO1
II	**Requirements Analysis and Specification:** Requirements gathering and analysis, Software requirements specification (SRS) **Software Design**: Good software design, cohesion and coupling, neat arrangement, software design approaches, object- oriented vs function-oriented design	12	CO2
III	**Function-Oriented Software Design:** Overview of SA/SD methodology, structured analysis, data flow diagrams (DFD's), structured design, detailed design.**User-Interface design:** Characteristics of a good interface; basic concepts; types of user interfaces;	12	CO3

	component based GUI development, a user interface methodology.		
IV	**Coding and Testing:** 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.**Software Reliability and Quality Management:** Software reliability; statistical testing; software quality; software quality management system; SEI capability maturity model; personal software process.	12	CO4
V	**Computer Aided Software Engineering:** 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. **Software Maintenance:** Characteristic of software maintenance; software reverse engineering; software maintenance process models; estimation of maintenance cost;	12	CO5
	Total	**60**	
	Course Outcomes		
Course Outcomes	On completion of this course, students will;		
CO1	Gain basic knowledge of analysis and design of systems	PO1	
CO2	Ability to apply software engineering principles and techniques	PO1, PO2	
CO3	Model a reliable and cost-effective software system	PO4, PO6	
CO4	Ability to design an effective model of the system	PO4, PO5, PO6	

CO5	Perform Testing at various levels and produce an efficient system.	PO3, PO8

Text Books	
1.	Rajib Mall, Fundamentals of Software Engineering, Fifth Edition, Prentice-Hall of India, 2018

References Books	
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:

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

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

Subject Code	Subject Name	Catego	L	T	P	S	Credi	Marks

		r y				t s	C I A	E xt er na l	T o t al
	MACHINE LEARNING TECHNIQUES	6	-	-	-	4	25	75	100
Learning Objectives									
LO1	To Learn about Machine Intelligence and Machine Learning applications								
LO2	To implement and apply machine learning algorithms to real-world applications								
LO3	To identify and apply the appropriate machine learning technique to classification, pattern recognition, optimization and decision problems								
LO4	To create instant based learning								
LO5	To apply advanced learning								

UNIT	Contents	No. Of. Hours
I	**Introduction Machine Learning** - Difference between AI, Machine Learning and Big data. Supervised and unsupervised learning, parametric vs non-parametric models, parametric models for classification and regression- Linear Regression, Logistic Regression, Naïve Bayes classifier, simple non-parametric classifier-K-nearest neighbour, support vector machines	18
II	**Neural networks and genetic algorithms** Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.	18
III	**Bayesian and computational learning** Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.	18
IV	**Instant based learning** K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.	18
V	**Advanced learning** Recommendation systems – opinion mining, sentiment analysis. Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning.	18
	TOTAL HOURS	90

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Appreciate the importance of visualization in the data analytics solution	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Apply structured thinking to unstructured problems	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Understand a very broad collection of machine learning algorithms and problems	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Learn algorithmic topics of machine learning and mathematically deep enough to introduce the required 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
Textbooks		
1	Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.	
2	Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning" 2015, MIT Press	
Reference Books		
1.	EthemAlpaydin, ―Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.	
2	Stephen Marsland, ―Machine Learning: An Algorithmic Perspective, CRC Press, 2009.	

Mapping with Programme Outcomes:

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

							Weightage
Weightage of course contributed to each PSO	**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	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

LAB EXERCISES	Required Hour

	75
1. Solving Regression & Classification using Decision Trees 2. Root Node Attribute Selection for Decision Trees using Information Gain 3. Bayesian Inference in Gene Expression Analysis 4. Pattern Recognition Application using Bayesian Inference 5. Bagging in Classification 6. Bagging, Boosting applications using Regression Trees 7. Data & Text Classification using Neural Networks 8. Using Weka tool for SVM classification for chosen domain application 9. Data & Text Clustering using K-means algorithm 10. Data & Text Clustering using Gaussian Mixture Models	

Course Outcomes	
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

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**
Weightage of course contributed to each PSO	11	15	15	15	5	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
	Network Security		Y	-	-	-	3	5	25	75	100

Course Objectives	
LO1	To familiarize on the model of network security, Encryption techniques

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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

	Total	75	

Course Outcomes

Course Outcomes	On completion of this course, students will;	
CO1	Analyze and design classical encryption techniques and block ciphers.	PO1, PO3, PO6, PO8
CO2	Understand and analyze public-key cryptography, RSA and other public-key cryptosystems such as Diffie-Hellman Key Exchange, ElGamal Cryptosystem, etc	PO1,PO2,PO3,PO6
CO3	Understand key management and distribution schemes and design User Authentication	PO3, PO5
CO4	Analyze and design hash and MAC algorithms, and digital signatures.	PO1, PO2, PO3, PO7
CO5	Know about Intruders and Intruder Detection mechanisms, Types of Malicious software,	P02, PO6, PO7

Reference Text :

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

References :

1.	CharlieKaufman,RadiaPerlman,MikeSpeciner,"NetworkSecurity,Privatecommunicatio ninpublicworld",PHISecondEdition,2002
2.	Bruce Schneier, Neils Ferguson, "Practical Cryptography", Wiley Dreamtech India Pvt Ltd, First Edition, 2003.
3.	DouglasRSimson"Cryptography–Theoryandpractice",CRCPress,FirstEdition,1995

Web Resources

1.	https://www.javatpoint.com/computer-network-security
2.	https://www.tutorialspoint.com/information_security_cyber_law/network_security.htm

3.	https://www.geeksforgeeks.org/network-security/				

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	2	2	1	1	1
CO 2	2	-	2	2	2	1
CO 3	3	2	2	2	1	-
CO 4	3	2	3	1	1	-
CO 5	3	2	2	1	3	1
Weightage of course contributed to each PSO	14	8	11	7	8	3

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	CIA	External	Total
									Marks		
	DataMiningAndWarehousing		Y	-	-	-	2	2	25	75	100
Course Objectives											
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.										

UNIT	Details	No. of Hours	Course Objectives
LO4	To study about Classification and Prediction, Classifier Accuracy		
LO5	To study the basic concepts of cluster analysis, Cluster Methods		
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 Warehouses.	15	CO3
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, Petitioning Methods – Hierarchical Methods-Density Based Methods – GRID Based Method – Model based Clustering Method	15	CO5
	Total	**75**	
	Course Outcomes		

Course Outcomes	On completion of this course, students will;	
CO1	To understand the basic concepts and the functionality of the various data mining and data warehousing component	PO1, PO3, PO6, PO8
CO2	To know the concepts of Data mining system architectures	PO1,PO2,PO3,PO6
CO3	To analyze the principles of association rules	PO3, PO5
CO4	To get analytical idea on Classification and prediction methods	PO1, PO2, PO3, PO7
CO5	To Gain knowledge on Cluster analysis and its methods.	PO2, PO6, PO7

Text Books	
(Latest Editions)	
1.	Han and M. Kamber, "Data Mining Concepts and Techniques", 2001, Harcourt India Pvt. Ltd, New Delhi.

References Books	
(Latest editions)	
1.	**K.P. Soman, ShyamDiwakar, V. Ajay "Insight into Data Mining Theory and Practice ",Prentice Hall of India Pvt. Ltd, New Delhi**
2.	**Parteek Bhatia, 'Data Mining and Data Warehousing: Principles and Practical Techniques', Cambridge University Press, 2019**

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

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
Weightage of course contributed to each PSO	12	14	10	15	9	11

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	MOBILE APPLICATION DEVELOPMENT		6	-	-	-	4	25	75	100

	Learning Objectives
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

UNIT	Contents	No. Of. Hours
I	**Android Fundamentals:** 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.	18
II	**Android User Interface:** Layouts: Linear, Relative, Frame and Scrollview- Managing changes to Screen Orientation. Views: TextView, Button, ImageButton, EditText, CheckBox, RadioButton, RadioGroup, ProgressBar, AutoCompleteTextView, ListViews and WebView	18
III	**Data Persistence:** 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.	18

IV	**SMS Messaging:** Sending and Receiving messages - Sending E-mail–Networking: Downloading Binary Data – Downloading Text Files.	**18**
V	**Location Based Services:** Displaying maps- Displaying zoom control- Changing view – Adding Markers- Getting the location – Geo-coding Publishing Android Applications: Preparing for publishing-Deploying APK Files.	**18**
	TOTAL HOURS	**90**

	Course Outcomes	Programme Outcomes
CO	On completion of this course, students will	
CO1	Appreciate the importance of visualization in the data analytics solution	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Apply structured thinking to unstructured problems	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Understand a very broad collection of machine learning algorithms and problems	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Learn algorithmic topics of machine learning and mathematically deep enough to introduce the required 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

	Textbooks
1	**WeiMeng Lee (2012),** "*Beginning Android Application Development*", WroxPublications (John Wiley, New York)

	Reference Books
1.	**Ed Burnette**, "*Hello Android: Introducing Google's Mobile Development Platform*", 3rd edition, 2010, The Pragmatic Publishers.
2	**Reto Meier**, "*Professional Android 4 Application Development*", 2012, Wrox Publications (John Wiley, New York).

	Web Resources
1.	https://www.tutorialspoint.com/mobile_development_tutorials.htm

2	https://www.tutorialspoint.com › 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
Weightage of course contributed to each PSO	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
	MOBILE APPLICATION DEVELOPMENT LAB		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

Lab Exercises	Required Hours

		60
1. Develop an application for Simple Counter. 2. Develop an application to display your personal details using GUI Components. 3. Develop a Simple Calculator that uses radio buttons and text view. 4. Develop an application that uses Intent and Activity. 5. Develop an application that uses Dialog Boxes. 6. Develop an application to display a Splash Screen. 7. Develop an application that uses Layout Managers. 8. Develop an application that uses different types of Menus. 9. Develop an application that uses to send messages from one mobile to another mobile. 10. Develop an application that uses to send E-mail. Develop an application that plays Audio and Video. 11. Develop an application that uses Local File Storage. 12. Develop an application for Simple Animation. 13. Develop an application for Login Page using Sqlite. 14. Develop an application for Student Marksheet processing using Sqlite.		

Course Outcomes	
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
CO 4	2	3	2	3	2	3

CO 5	2	2	-	3	3	3
Weightage of course contributed to each PSO	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	CIA	External	Total
	Introduction to Data Science		-	Y	-	-	4	4	25	75	100

Course Objective		
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	**Introduction:** Benefits and uses – Facts of data – Data science process – Big data ecosystem and data science	15
II	**The Data science process**:Overview – research goals - retrieving data - transformation – Exploratory Data Analysis – Model building .	15
III	**Algorithms** :Machine learning algorithms – Modeling process – Types – Supervised – Unsupervised - Semi-supervised	15

IV	**Introduction to Hadoop** :Hadoop framework – Spark – replacing MapReduce– NoSQL – ACID – CAP – BASE – types	15
V	**Case Study**: Prediction of Disease - Setting research goals - Data retrieval – preparation - exploration - Disease profiling - presentation and automation	12
	Total	**75**

Course Outcomes		Programme Outcome
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

Text Book	
1	Davy Cielen, Arno D. B. Meysman, Mohamed Ali, "Introducing Data Science", manning publications 2016

Reference Books	
1.	Roger Peng, "The Art of Data Science", lulu.com 2016.
2.	MurtazaHaider, "Getting Started with Data Science – Making Sense of Data with Analytics", IBM press, E-book.
3.	Davy Cielen, Arno D.B. Meysman, Mohamed Ali, "Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools", Dreamtech Press 2016.
4.	Annalyn Ng, Kenneth Soo, "Numsense! Data Science for the Layman: No Math Added", 2017,1st Edition.
5.	Cathy O'Neil, Rachel Schutt, "Doing Data Science Straight Talk from the Frontline", O'Reilly Media 2013.

6.	Lillian Pierson, "Data Science for Dummies", 2017 II Edition

Web Resources	
1.	https://www.w3schools.com/datascience/
2.	https://en.wikipedia.org/wiki/Data_science
3.	http://www.cmap.polytechnique.fr/~lepennec/en/post/references/refs/

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
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
Weightage of course contributed to each PSO	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
Learning Objectives									
LO1	Gain a solid understanding of what software metrics are and their significance								
LO2	Learn how to identify and select appropriate software metrics based on project goals								
LO3	Acquire knowledge and skills in collecting and measuring software metrics								
LO4	Learn how to analyze and interpret software metrics data to extract valuable insights								
LO5	Gain the ability to evaluate software quality using appropriate metrics								
Unit	Contents							No. of Hours	
I	**Fundamentals of Measurement: Need for** Measurement: Measurement in Software Engineering, Scope of Software Metrics, **The Basics of measurement**: The representational theory of measurement, Measurement and models, Measurement scales and scale types, meaningfulness in measurement							15	
II	**A Goal-Based Framework For Software Measurement:** Classifying software measures, Determining what to Measure, Applying the framework, Software measurement validation, Performing SoftwareMeasurementValidation **Empirical investigation**: Principles of Empirical Studies, Planning Experiments, Planning case studies as quasi-experiments, Relevant and Meaningful Studies							15	
III	**Software Metrics Data Collection:** Defining good data, Data collection for incident reports, How to collect data, Reliability of data collection Procedures **Analyzing software measurement data:** Statistical distributions and hypothesis testing, Classical data analysis techniques, Examples of simple							15	

	analysis techniques	
IV	**Measuring internal product attributes: Size** Properties of Software Size, Code size, Design size, Requirements analysis and Specification size, Functional size measures and estimators, Applications of size measures **Measuring internal product attributes: Structure:** Aspects of Structural Measures, Control flow structure of program units, Design-levelAttributes, Object-oriented Structural attributes and measures	**15**
V	**Measuring External Product Attributes:** Modelling software quality, Measuring aspects of quality, Usability Measures, Maintainability measures,SecurityMeasures **Software Reliability: Measurement and Prediction:** Basics of reliability theory, The software reliability problem, Parametric reliability growth models, Predictive accuracy	**15**
	TOTAL	**75**

CO	Course Outcomes
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

	Textbooks
☐	**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.**

NOTE: Latest Edition of Textbooks May be Used
Web Resources

	https://lansa.com/blog/general/what-are-software-metrics-how-can-i-measure-these-metrics/
1.	
2.	https://stackify.com/track-software-metrics/

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
Weightage of course contributed to each PSO	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
	NATURAL LANGUAGE PROCESSING	**Elect**	5	-	-	-	3	25	75	100
Learning Objectives										
LO1	To understand approaches to syntax and semantics in NLP.									
LO2	To learn natural language processing and to learn how to apply basic algorithms in this field.									
LO3	To understand approaches to discourse, generation, dialogue and summarization within NLP.									

LO4	To get acquainted with the algorithmic description of the main language levels: morphology, syntax, semantics, pragmatics etc.
LO5	To understand current methods for statistical approaches to machine translation.

UNIT	Contents	No. Of. Hours
I	**Introduction :** Natural Language Processing tasks in syntax, semantics, and pragmatics – Issue- Applications – The role of machine learning – Probability Basics –Information theory – Collocations -N-gram Language Models – Estimating parameters and smoothing – Evaluating language models.	15
II	**Word level and Syntactic Analysis:** Word Level Analysis: Regular Expressions-Finite-State Automata-Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging.Syntactic Analysis: Context-free Grammar-Constituency- Parsing-Probabilistic Parsing.	15
III	**Semantic analysis and Discourse Processing:** Semantic Analysis: Meaning Representation-Lexical Semantics- Ambiguity-Word Sense Disambiguation. Discourse Processing: cohesion-Reference Resolution- Discourse Coherence and Structure.	15
IV	**Natural Language Generation:** Architecture of NLG Systems-Generation Tasks and Representations- Application of NLG. Machine Translation: Problems in Machine Translation. Characteristics of Indian Languages- Machine Translation Approaches-Translation involving Indian Languages.	15
V	**Information retrieval and lexical resources:** Information Retrieval: Design features of Information Retrieval Systems-Classical, Non-classical, Alternative Models of Information Retrieval – valuation Lexical Resources: WorldNet-Frame NetStemmers- POS Tagger- Research Corpora SSAS.	15

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Describe the fundamental concepts and techniques of natural language processing.	PO1, PO2, PO3, PO4, PO5, PO6

	Explain the advantages and disadvantages of different NLP technologies and their applicability in different business situations.	
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. Use NLP methods to analyse sentiment of a text document.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Analyze large volume text data generated from a range of real-world applications. Use NLP methods to perform topic modelling.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Develop robotic process automation to manage business processes and to increase and monitor their efficiency and effectiveness. Determine the framework in which artificial intelligence and the Internet of things may function, including interactions with people, enterprise functions, and environments.	PO1, PO2, PO3, PO4, PO5, PO6
Textbooks		
1	Daniel Jurafsky, James H. Martin, "Speech & language processing", Pearson publications.	
2	Allen, James. Natural language understanding. Pearson, 1995.	
Reference Books		
1.	Pierre M. Nugues, "An Introduction to Language Processing with Perl and Prolog",Springer	
Web Resources		
1.	https://en.wikipedia.org/wiki/Natural_language_processing	
2.	https://www.techtarget.com/searchenterpriseai/definition/natural-language-processing-NLP	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	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
Weightageof coursecontributedtoeachPSO	12	14	13	15	11	13

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	ANALYTICS FOR SERVICE INDUSTRY	Elective	5	-	-	-	3	25	75	100

<table>
<tr><td colspan="2" align="center">Learning Objectives</td></tr>
<tr><td>LO1</td><td>Recognize challenges in dealing with data sets in service industry.</td></tr>
<tr><td>LO2</td><td>Identify and apply appropriate algorithms for analyzing the healthcare, Human resource, hospitality and tourism data.</td></tr>
<tr><td>LO3</td><td>Make choices for a model for new machine learning tasks.</td></tr>
<tr><td>LO4</td><td>To identify employees with high attrition risk.</td></tr>
<tr><td>LO5</td><td>To Prioritizing various talent management initiatives for your organization.</td></tr>
</table>

UNIT	Contents	No. Of. Hours
I	**Healthcare Analytics :** 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-	15

		Genomic Data Analysis for Personalized Medicine. Review of Clinical Prediction Models.	
	II	**Healthcare Analytics Applications :** 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.	**15**
	III	**HR Analytics:** 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.	**15**
	IV	**Performance Analysis:** Predicting employee performance, Training requirements, evaluating training and development, Optimizing selection and promotion decisions.	**15**
	V	**Tourism and Hospitality Analytics:** Guest Analytics – Loyalty Analytics – Customer Satisfaction – Dynamic Pricing – optimized disruption management – Fraud detection in payments.	**15**
		TOTAL HOURS	**75**

Course Outcomes		Programme Outcomes
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

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	Instill a sense of ethical decision-making and a commitment to	
CO5	the long-run welfare of both organizations and the communities they serve.	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks	
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.

Reference Books	
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.

Web Resources	
1.	https://www.ukessays.com/essays/marketing/contemporary-issues-in-marketing-marketing-essay.php
2.	https://yourbusiness.azcentral.com/examples-contemporary-issues-marketing-field-26524.html

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
Weightageof coursecontributedtoeachPSO	14	15	14	15	15	14

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

Subject Code	Subject Name	Cat	L	T	P	S	Cr	Marks

		eg or y					e d i t s	C I A	E xt er na l	T o t a l
	CRYPTOGRAPHY	Elec t	4	-	-	-	3	25	75	10 0

Learning Objectives	
LO1	To understand the fundamentals of Cryptography
LO2	To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
LO3	To understand the various key distribution and management schemes.
LO4	To understand how to deploy encryption techniques to secure data in transit across data networks
LO5	To design security applications in the field of Information technology

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

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Analyze the vulnerabilities in any computing system and hence be able to design a security solution.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	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

	Textbooks
1	**William Stallings,** "Cryptography and Network Security Principles andPractices".

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

	Web Resources
1	https://www.tutorialspoint.com/cryptography/
2	https://gpgtools.tenderapp.com/kb/how-to/introduction-to-cryptography

Mapping with Programme Outcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	S	Cr	In	Marks

							e d i t s	s t . H o u r s	CI A	E x t e r n a l	Tot al
	Database Management System	Core	Y	-	-	-	4	5	25	75	100

<table>
<tr><td colspan="4" align="center">Course Objective</td></tr>
<tr><td>LO1</td><td colspan="3">To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.</td></tr>
<tr><td>LO2</td><td colspan="3">To understood the concepts of data base management system, design simple Database models</td></tr>
<tr><td>LO3</td><td colspan="3">To learn and understand to write queries using SQL, PL/SQL.</td></tr>
<tr><td>LO4</td><td colspan="3">To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.</td></tr>
<tr><td>LO5</td><td colspan="3">To understood the concepts of data base management system, design simple Database models</td></tr>
</table>

UNIT	Details	No. of Hours	Course Objective
	Database Concepts: Database Systems - Data vs Information - Introducing the database -File system - Problems with file system – Database systems. Data models - Importance - Basic Building Blocks - Business rules - Evolution of Data models - Degrees of Data Abstraction	15	CO1
II	**Design Concepts:** Relational database model - logical view of data-keys -Integrity rules - relational set operators - data dictionary and the system catalog - relationships -data redundancy revisited -indexes - codd's rules. Entity relationship model - ER diagram	15	CO2

III	**Normalization of Database Tables**: Database tables and Normalization – The Need for Normalization –The Normalization Process – Higher level Normal Form. **Introduction to SQL**: Data Definition Commands – Data Manipulation Commands – SELECT Queries – Additional Data Definition Commands – Additional SELECT Query Keywords – Joining Database Tables.	15	CO3
IV	**Advanced SQL**:Relational SET Operators: UNION – UNION ALL – INTERSECT - MINUS.SQL Join Operators: Cross Join – Natural Join – Join USING Clause – JOIN ON Clause – Outer Join.**Sub Queries and Correlated Queries**: WHERE – IN – HAVING – ANY and ALL – FROM. SQL Functions: Date and Time Function – Numeric Function – String Function – Conversion Function	15	CO4
V	**PL/SQL**:A Programming Language: History – Fundamentals – Block Structure – Comments – Data Types – Other Data Types – Variable Declaration – Assignment operation –Arithmetic operators.**Control Structures and Embedded SQL**: Control Structures – Nested Blocks – SQL in PL/SQL – Data Manipulation – Transaction Control statements. **PL/SQL Cursors and Exceptions**: Cursors – Implicit Cursors, Explicit Cursors and Attributes – Cursor FOR loops – SELECT…FOR UPDATE – WHERE CURRENT OF clause – Cursor with Parameters – Cursor Variables – Exceptions – Types of Exceptions.	15	CO5
	Total	**75**	

Course Outcomes		Programme Outcomes
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
Text Book		
1	Coronel, Morris, Rob, "Database Systems, Design, Implementation and Management", Ninth Edition	
2	Nilesh Shah, "Database Systems Using Oracle", 2nd edition, Pearson Education India, 2016	
Reference Books		
1.	Abraham Silberschatz, Henry F.Korth and S.Sudarshan,"Database System Concepts", McGraw Hill International Publication ,VI Edition	
2.	Shio Kumar Singh , "Database Systems ",Pearson publications ,II Edition	
Web Resources		
1.	Web resources from NDL Library, E-content from open-source libraries	

Mapping with Programme Outcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Big Data Analytics		Y	-	-	-	3	5	25	75	100

	Course Objective		
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 Use Cases- Characteristics of Big Data Applications — Perception and Quantification of Value -Understanding Big Data Storage — A General Overview of High-Performance Architecture — HDFS — MapReduce and YARN — Map Reduce Programming Model	15	C1
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
	Total	**75**	

	Course Outcomes	Programme Outcomes
CO	On completion of this course, students will	
1	Work with big data tools and its analysis techniques.	PO1
2	Analyze data by utilizing clustering and classification algorithms.	PO1, 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
	Text Book	

1	AnandRajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.

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

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

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	1	3	2	2	3	1
CO 2	3	2	3	2	3	3
CO 3	1	3	2	2	2	1
CO 4	3	3	3	1	3	3
CO 5	3	2	3	3	3	3
Weightage of course contributed to each PSO	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
	Internet of Things and its applications		Y	-	-	-	4	5	25	75	100

	Course Objective										
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 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.	15	C2
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 GasIndustry, 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
	Total	**75**	

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
1	Work with big data tools and its analysis techniques.	PO1
2	Analyze data by utilizing clustering and classification algorithms.	PO1, 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
Text Book		
1	Vijay Madisetti and Arshdeep Bahga, "Internet of Things: (A Hands-on Approach)", Universities Press (INDIA) Private Limited 2014, 1st Edition.	
Reference Books		

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

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

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
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
Weightage of course contributed to each PSO	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
Learning Objectives									

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

Unit	Contents	No. of Hours
I	**Introduction to Competencies - Product Development Techniques - Management Skills - Product Development Life Cycle - Software Development Process and models - The SEI CMM - International Organization for Standardization.**	**15**
II	**Managing Domain Processes - Project Selection Models - Project Portfolio Management - Financial Processes - Selecting a Project Team - Goal and Scope of the Software Project -Project Planning - Creating the Work Breakdown Structure - Approaches to Building a WBS - Project Milestones - Work Packages - Building a WBS for Software.**	**15**
III	**Tasks and Activities - Software Size and Reuse Estimating - The SEI CMM - Problems and Risks - Cost Estimation - Effort Measures - COCOMO: A Regression Model - COCOMO II - SLIM: A Mathematical Model - Organizational Planning - Project Roles and Skills Needed.**	**15**
IV	**Project Management Resource Activities - Organizational Form and Structure - Software Development Dependencies - Brainstorming - Scheduling Fundamentals - PERT and CPM - Leveling Resource Assignments - Map the Schedule to a Real Calendar - Critical Chain Scheduling.**	**15**
V	**Quality: Requirements – The SEI CMM - Guidelines - Challenges - Quality Function Deployment - Building the Software Quality Assurance - Plan - Software Configuration Management: Principles - Requirements - Planning and Organizing - Tools - Benefits - Legal Issues in Software - Case Study**	**15**
TOTAL		**75**

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

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

Reference Books	
1.	Pankaj Jalote, "Software Project Management in Practice", Addison Wesley 2002.
2.	Hughes, "Software Project Management", Tata McGraw Hill 2004, 3rd Edition.

NOTE: Latest Edition of Textbooks May be Used

Web Resources	
1.	NPTEL & MOOC courses titled Software Project Management
2.	www.smartworld.com/notes/software-project-management

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	Image Processing	Elective	-	Y	-	-	3	5	25	75	100

	Course Objective	
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	**Digital Image Fundamentals:** 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 of image- Compression schemes- Huffman coding- Arithmetic coding- Dictionary based compression -Transform based compression,	15
	Total	**75**
Course Outcomes		**Programme Outcome**

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

Text Book

1	S Jayaraman, S Esakkirajan, T Veerakumar, Digital image processing ,Tata McGraw Hill, 2015
2	Gonzalez Rafel C, Digital Image Processing, Pearson Education, 2009

Reference Books

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

Web Resources

1.	https://kanchiuniv.ac.in/coursematerials/Digital%20image%20processing%20-Vijaya%20Raghavan.pdf
2.	http://sdeuoc.ac.in/sites/default/files/sde_videos/Digital%20Image%20Processing%20 3rd%20ed.%20-%20R.%20Gonzalez%2C%20R.%20Woods-ilovepdf-compressed.pdf
3.	https://dl.acm.org/doi/10.5555/559707
4.	https://www.ijert.org/image-processing-using-web-2-0-2

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

Weightage of course contributed to each PSO	13	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
	Information Security	**Elective**	Y	-	-	-	3	5	25	75	100

Course Objectives

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:	15	CO2

	Concepts and Techniques: Introduction, plain text 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
	Total	**75**	

Course Outcomes

Course Outcomes	On completion of this course, students will;	Programme Outcomes
CO1	Understand network security threats, security services, and countermeasures	PO1
CO2	Understand vulnerability analysis of network security	PO1, PO2

CO3	Acquire background on hash functions; authentication; firewalls; intrusion detection techniques	PO4, PO6
CO4	Gain hands-on experience with programming and simulation techniques for security protocols.	PO4, PO5, PO6
CO5	Apply methods for authentication, access control, intrusion detection and prevention	PO3, PO8

Text Books	
(Latest Editions)	
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

References Books	
(Latest editions, and the style as given below must be strictly adhered to)	
1.	**Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, lst Edition**
2.	**Cryptography and Network Security : Forouzan Mukhopadhyay, Mc Graw Hill, 2"d Edition**
3.	**Information Security, Principles and Practice: Mark Stamp, Wiley India**
4.	**Principles of Computer Sceurity: WM.Arthur Conklin, Greg White, TMH**

Web Resources	
1.	https://www.geeksforgeeks.org/what-is-information-security/
2.	https://www.tutorialspoint.com/what-is-information-security#:~:text=Information%20security%20is%20designed%20and,destruction%2C%20alteration%2C%20and%20disruption.

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	-
CO 5	2	3	1	3	3	2
Weightage of course contributed to each PSO	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
	Human Computer Interaction	Elective	-	Y	-	-	3	5	25	75	100

	Course Objective			
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	**FOUNDATIONS OF HCI :** ● The Human: I/O channels – Memory ● Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; ● Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. - Case Studies	15
II	**DESIGN & SOFTWARE PROCESS:** ● Interactive Design: ● Basics – process – scenarios ● Navigation: screen design Iteration and prototyping. ● HCI in software process: ● Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design	15
III	**MODELS AND THEORIES:** ● HCI Models : Cognitive models:- Socio-Organizational issues and stakeholder requirements Communication and collaboration models-Hypertext, Multimedia and WWW.	15
IV	**Mobile HCI:** ● Mobile Ecosystem: Platforms, Application frameworks ● Types of Mobile Applications: Widgets, Applications, Games ● Mobile Information Architecture, Mobile 2.0, ● Mobile Design: Elements of Mobile Design, Tools. - Case Studies	15
V	**WEB INTERFACE DESIGN:** Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow - Case Studies	15
	Total	**75**

Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
1	Understand the fundementals 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
Text Book		
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)	
Reference Books		
1.	Shneiderman, "Designing the User Interface: Strategies for Effective Human-Computer Interaction", V Edition, Pearson Education.	
Web Resources		
1.	https://www.interaction-design.org/literature/topics/human-computer-interaction	
2.	https://link.springer.com/10.1007/978-0-387-39940-9_192	
3.	https://en.wikipedia.org/wiki/Human%E2%80%93computer_interaction	

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
Weightage of course contributed to each PSO	11	6	7	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
	Fuzzy Logic	Elective	Y	-	-	-	3	5	25	75	100

Course Objective	
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	15	

				C1
	Fuzzy Relations: Introduction-Cartesian Product of Relation-Classical Relations-Cardinality of Crisp Relation.			
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, Formation of Rules, Decomposition of Rules, Aggregation of Fuzzy Rules, Properties of Set of Rules.	15		C4
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
	Total			

	Course Outcomes	**Programme Outcomes**
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 usethe 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
Text Book		
1	S. N. Sivanandam, S. Sumathi and S. N. Deepa-Introduction to Fuzzy Logic using MATLAB, Springer-Verlag Berlin Heidelberg 2007.	
Reference Books		
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	
Web Resources		
1.	https://www.javatpoint.com/fuzzy-logic	
2.	https://www.guru99.com/what-is-fuzzy-logic.html	

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
Weightage of course contributed to each PSO	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
	Artificial Intelligence	Elective	-	Y	-	-	3	5	25	75	100

	Course Objective	
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
	Total	**75**

Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
1	Understand the various concepts of AI Techniques.	PO1
2	Understand various Search Algorithm in AI.	PO1, PO2
3	Understand probabilistic reasoning and models in AI.	PO4, PO6
4	Understand Markov Decision Process.	PO4, PO5, PO6
5	Understand various type of Reinforcement learning Techniques.	PO3, PO8

Text Book	
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

Reference Books	
1.	Trivedi, M.C., "A Classical Approach to Artifical 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

Web Resources	
1.	NPTEL&MOOCcoursestitledArtificialIntelligenceandExpertSystems

2.	https://nptel.ac.in/courses/106106140/
3.	https://nptel.ac.in/courses/106106126/

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
Weightage of course contributed to each PSO	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
	Mobile Ad-hoc Network	Elective	-	Y	-	-	3	5	25	75	100

	Course Objective										
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 .

UNIT	Details	No. of Hours
LO5	To learn about cross layer design and optimization techniques, Integration of ad-hoc with Mobile IP networks.	
I	**Introduction**: Introduction to ad-hoc networks – definition, characteristics features, applications. Characteristics of wireless channel, ad-hoc mobility models indoor and out-door models.	15
II	**Medium Access Protocol:** ● MAC Protocols: Design issues, goals and classification. ● Contention based protocols – with reservation, scheduling algorithms, protocols using directional antennas. ● IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.	15
III	**Network Protocols :** 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	**End – end delivery and security:** 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
	Total	**75**

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

Text Book	
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

Reference Books	
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.

Web Resources	
1.	https://en.wikipedia.org/wiki/Wireless_ad_hoc_network
2.	https://www.ijert.org/mobile-ad-hoc-network
3.	https://books.google.com/books/about/Mobile_Ad_Hoc_Networking.htmlid=GnkcHEs xAigC

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
Weightage of course contributed to each PSO	12	10	5	14	14	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
	Computatiional Intelligence	Elective	Y	-	-	-	3	5	25	75	100

	Course Objective	
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 Artifical Neural Network	
LO5	To study about the Genetic Algorithm.	

UNIT	Details	No. of Hours	Course Objective
I	**Introduction to AI**: Problem formulation – AI Applications – Problems – State Space and Search – Production Systems – Breadth First and Depth First – Travelling Salesman Problem – Heuristic search	15	C1

	techniques: Generate and Test – Types of Hill Climbing.		
II	**Fuzzy Logic Systems:** 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	**Neural Networks:** What is Neural Network, Learning 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	15	C3
IV	**Artificial Neural Networks:** Fundamental Concepts – Basic Models of Artificial Neural Networks – Important Terminologies of ANNs – McCulloch-Pitts Neuron – Linear Separability – Hebb Network.	15	C4
V	**Genetic Algorithm:** Introduction – Biological Background – Genetic Algorithm Vs Traditional Algorithm – Basic Terminologies in Genetic Algorithm – Simple GA – General Genetic Algorithm – Operators in Genetic Algorithm	15	C5
	Total	**75**	

Course Outcomes		Programme Outcomes
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

	Text Book	
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.	https://www.javatpoint.com/artificial-intelligence-tutorial	
2.	https://www.w3schools.com/ai/	

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
Weightage of course contributed to each PSO	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
	Grid Computing	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 Anotomy.	
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	15

	Mechanisms, Relationship between Web Services and Grid Services, Web services Interoperability and the role of the WS-I Organization.	
	Total	**75**

Course Outcomes		Programme Outcome
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 Anotomy 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

Text Book	
1	Joshy Joseph and Craig Fellenstein, Grid computing, Pearson / IBM Press, PTR, 2004.

Reference Books	
1.	1. Ahmer Abbas and Graig computing, A Practical Guide to technology and applications, Charles River Media, 2003.

Web Resources	
1.	https://en.wikipedia.org/wiki/Grid_computing
2.	https://link.springer.com/chapter/10.1007/978-1-84882-409-6_4
3.	https://www.redbooks.ibm.com/redbooks/pdfs/sg246778.pdf

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
Weightage of course contributed to each PSO	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
	Cloud Computing	Elective	-	Y	-	-	4	4	25	75	100

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

UNIT	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. 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	Cloud Services Compute Services: Amazon Elastic Computer Cloud - Google Compute Engine - Windows Azure Virtual Machines Storage Services: Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage Database Services: Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database - Windows Azure Table Service Application Services: Application Runtimes and Frameworks - Queuing Services - Email Services - Notifiction Services - Media Services Content Delivery Services: Amazon CloudFront - Windows Azure Content Delivery Network Analytics Services: Amazon Elastic MapReduce - Google MapReduce Service - Google BigQuery - Windows Azure HDInsight Deployment and Management Services: Amazon Elastic Beanstack - Amazon CloudFormation Identity and Access Management Services: Amazon Identiy and Access Management - Windows Azure Active Directory Open Source Private Cloud Software: CloudStack – Eucalyptus - OpenStack	15
III	**Cloud Application Design:** Introduction – Design Consideration for Cloud Applications – Scalability – Reliability and Availability – Security – Maintenance and Upgradation – Performance – Reference Architectures for Cloud Applications – Cloud Application Design Methodologies: Service Oriented Architecture (SOA), Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller (MVC), RESTful Web Services – Data Storage Approaches: Relational Approach (SQL), Non-Relational Approach (NoSQL).	15
IV	**Cloud Application Benchmarking and Tuning:** Introduction to Benchmarking – Steps in Benchmarking – Workload Characteristics – Application Performance Metrics – Design Consideration for Benchmarking Methodology – Benchmarking Tools and Types of Tests – Deployment Prototyping. **Cloud Security:** 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.	15

V	**Case Studies:** Cloud Computing for Healthcare – Cloud Computing for Energy Systems - Cloud Computing for Transportation Systems - Cloud Computing for Manufacturing Industry - Cloud Computing for Education.	15
	Total	**75**

Course Outcomes		Programme Outcome
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

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

Reference Books	
1.	Anthony T Velte, Toby J Velte, Robert Elsenpeter, *Cloud Computing: A Practical Approach*, Tata McGraw-Hill, 2013.
2.	Barrie Sosinsky, *Cloud Computing Bible*, Wiley India Pvt. Ltd., 2013.
3.	David Crookes, *Cloud Computing in Easy Steps*, Tata McGraw Hill, 2015.
4.	Dr. Kumar Saurabh, *Cloud Computing*, Wiley India, Second Edition 2012.

Web Resources	
1.	https://en.wikipedia.org/wiki/Cloud_computing
2.	https://link.springer.com/chapter/10.1007/978-3-030-34957-8_7

3.	https://webobjects.cdw.com/webobjects/media/pdf/solutions/cloud-computing/121838-CDW-Cloud-Computing-Reference-Guide.pdf

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
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
Weightage of course contributed to each PSO	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
	Artificial Neural Networks		-	Y	-	-	3	5	25	75	100

	Course Objective	
LO1	**Understand the basics of artificial neural networks, learning process, single layer and multi-layer perceptron networks.**
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.

UNIT	Details	No. of Hours
LO5	Analyze the Deep Learning of various Neural network and its Applications.	
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- Error correction - Gradient Descent Rules, Perception Learning Algorithm, Perception Convergence Theorem.	15
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
	Total	**75**

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

1	**Students will learn the basics of artificial neural networks with single layer and multi-layer perception networks.**	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

	Text Book
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.

	Reference Books
1.	Artificial Neural Networks-B. Yegnanarayana, PHI, New Delhi 1998.

	Web Resources
1.	https://www.w3schools.com/ai/ai_neural_networks.asp
2.	https://en.wikipedia.org/wiki/Artificial_neural_network
3.	https://link.springer.com/chapter/10.1007/978-3-642-21004-4_12

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
Weightage of course contributed to each PSO	13	12	13	10	11	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
	Agile Project Management	Elective	-	Y	-	-	3	5	25	75	100
Course Objective											
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	**Introduction:Modernizing Project Management:** Project Management Needed a Makeover – Introducing Agile Project Management. **Applying the Agile Manifesto and Principles:** 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. **Why Being Agile Works Better:** Evaluating Agile benefits – How Agile approaches beat historical approaches – Why people like being Agile.	15
II	**Being Agile** **Agile Approaches:** Diving under the umbrella of Agile approaches – Reviewing the Big Three: Lean, Scrum, Extreme Programming - Summary **Agile Environments in Action:** Creating the physical environment – Low-tech communicating – High-tech communicating – Choosing tools. **Agile Behaviours in Action:** Establishing Agile roles – Establishing new values – Changing team philosophy.	15
III	**Agile Planning and Execution** **Defining the Product Vision and Roadmap:** Agile planning – Defining the product vision – Creating a product roadmap – Completing the product backlog. **Planning Releases and Sprints:** Refining requirements and estimates – Release planning – Sprint planning.	15

	Working Throughout the Day: Planning your day – Tracking progress – Agile roles in the sprint – Creating shippable functionality – The end of the day. **Showcasing Work, Inspecting and Adapting:** The sprint review – The sprint retrospective. **Preparing for Release:** Preparing the product for deployment (the release sprint) – Preparing the operational support – Preparing the organization for product deployment - Preparing the marketplace for product deployment		
IV	**Agile Management** **Managing Scope and Procurement:** What's different about Agile scope management – Managing Agile scope – What's different about Agile procurement – Managing Agile procurement. **Managing Time and Cost:** What's different about Agile time management – Managing Agile schedules – What's different about Agile cost management – Managing Agile budgets. **Managing Team Dynamics and Communication:** What's different about Agile team dynamics – Managing Agile team dynamics – What's different about Agile communication – Managing Agile communication. **Managing Quality and Risk:** What'sdifferent about Agile quality – Managing Agile quality – What's different about Agile risk management – Managing Agile risk.	15	
V	**Implementing Agile** **Building a Foundation:** Organizational and individual commitment – Choosing the right pilot team members – Creating and environment that enables Agility – Support Agility initially and over time.	15	

	Being a Change Agent: Becoming Agile requires change – why change doesn't happen on its own – Platinum Edge's Change Roadmap – Avoiding pitfalls – Signs your changes are slipping. **Benefits, Factors for Success and Metrics:** Ten key benefits of Agile project management – Ten key factors for project success – Ten metrics for Agile Organizations.	
	Total	**75**

Course Outcomes		Programme Outcome
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

Text Book	
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.

Reference Books	
1.	**Mark C. Layton, David Morrow, *Scrum for Dummies*, 2nd Edition, Wiley India Pvt. Ltd., 2018.**
2.	**Mike Cohn, Succeeding with Agile – Software Development using Scrum, Addison-Wesley Signature Series, 2010.**

3.	Alex Moore, Agile Project Management, 2020.
4.	Alex Moore, *Scrum*, 2020.
5.	Andrew Stellman and Jennifer Greene, *Learning Agile: Understanding Scrum, XP, Lean, and Kanban*, Shroff/O'Reilly, First Edition, 2014.
Web Resources	
1.	www.agilealliance.org/resources

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
Weightage of course contributed to each PSO	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
	FUNDAMENTALS OF INFORMATION TECHNOLOGY	Specific Elective	2	-	-	I	2	25	75	100
Learning Objectives										
LO1	Understand basic concepts and terminology of information technology.									
LO2	Have a basic understanding of personal computers and their operation									
LO3	Be able to identify data storage and its usage									
LO4	Get great knowledge of software and its functionalities									
LO5	Understand about operating system and their uses									
UNIT	Contents									No. Of. Hours
I	**Introduction to Computers** - Generations of Computer – Data and Information – Components of Computer – Software – Hardware – Input Devices - Output Devices — Types of Operating System.									6
II	**MS Word**: Introduction – Elements of Window – Files, Folders 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.									6
III	**Ms Excel**: Introduction – Inserting rows and columns – Sizing rows and columns – Implementing formulas – Generating series - Functions in excel – Creation of Chart – Inserting objects – Filter – Sorting – Inserting worksheet.									6
IV	**MS PowerPoint**: Introduction – Slides Manipulation (Inserting new, Copy, paste, delete and duplicate slides) – Slide show– Types of Views – Types of Animations – Inserting Objects – Implementing multimedia (Video and Audio) – Templates (Built-in and User-Defined).									6

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

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

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

	Reference Books
1.	Bhardwaj Sushil Puneet Kumar, "Fundamental of Information Technology"
2.	GG WILKINSON, "Fundamentals of Information Technology", Wiley-Blackwell
3.	A Ravichandran , "Fundamentals of Information Technology", Khanna Book Publishing

	Web Resources
1.	https://testbook.com/learn/computer-fundamentals

2.	https://www.tutorialsmate.com/2020/04/computer-fundamentals-tutorial.html
3.	https://www.javatpoint.com/computer-fundamentals-tutorial
4.	https://www.tutorialspoint.com/computer_fundamentals/index.htm
5.	https://www.nios.ac.in/media/documents/sec229new/Lesson1.pdf

Mapping with Programme Outcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	INTRODUCTION TO HTML	Specific Elective	2	-	-		2	25	75	100
Learning Objectives										
LO1	Insert a graphic within a web page.									

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

UNIT	Contents	No. Of. Hours
I	**Introduction :WebBasics: WhatisInternet–Webbrowsers–WhatisWebpage –HTMLBasics:Understandingtags.**	**6**
II	**TagsforDocumentstructure(HTML,Head,BodyTag).Blockleveltextelements: Headingsparagraph(\<p\> tag)–Fontstyleelements:(bold,italic,font,small,strong,strike,bigtags)**	**6**
III	**Lists:Typesoflists:Ordered,Unordered– NestingLists–Othertags:Marquee,HR,BR-UsingImages –CreatingHyperlinks.**	**6**
IV	**Tables:CreatingbasicTable,Tableelements,Caption–Tableandcellalignment– Rowspan,Colspan–Cellpadding.**	**6**
V	**Frames:Frameset–TargetedLinks–Noframe–Forms:Input, Textarea,Select,Option.**	**6**
	TOTAL HOURS	**30**

	Course Outcomes	Programme Outcomes
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	**Knows Design concept. Concept of Meta Data Understand the concept of save the files.**	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

	Textbooks
1	"Mastering HTML5 and CSS3 Made Easy", TeachUComp Inc., 2014.

2	Thomas Michaud, "Foundations of Web Design: Introduction to HTML & CSS"
	Web Resources
1.	https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf
2.	https://www.w3schools.com/html/default.asp

Mapping with Programme Outcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	WEB DESIGNING	Specific Elective	Y	-	-	-	2	2	25	75	100
		Course Objective									
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
	Total	**60**	

Course Outcomes		Programme Outcome
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

Text Book	
1	Pankaj Sharma, "Web Technology", SkKataria& Sons Bangalore 2011.
2	Mike Mcgrath, "Java Script", Dream Tech Press 2006, 1st Edition.
3	Achyut S Godbole&AtulKahate, "Web Technologies", 2002, 2nd Edition.

Reference Books	
1.	Laura Lemay, RafeColburn , Jennifer Kyrnin, "Mastering HTML, CSS &Javascript Web Publishing", 2016.
2.	DT Editorial Services (Author), "HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)", Paperback 2016, 2nd Edition.

Web Resources	
1.	NPTEL & MOOC courses titled Web Design and Development.
2.	https://www.geeksforgeeks.org

Mapping with Programme Outcomes:

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
Weightage of course contributed to each PSO	15	15	3	10	3	4

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

Subject Code	Subject Name	Cate gory	L	T	P	S	C r e	I n s	Marks

						dits	t. Hours	CIA	External	Total
	PHP PROGRAMMING	Specific Elective	Y			2	2	25	75	100

Course Objective	
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
Total			**30**

Course Outcomes		Programme Outcomes
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.

Text Book	
1	**Head First PHP & MySQL: A Brain-Friendly Guide- 2009-Lynn mighley and Michael Morrison.**
2	**The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL- Alan Forbes**

Reference Books	
1.	PHP: The Complete Reference-Steven Holzner.
2.	DT Editorial Services (Author), "*HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)*", Paperback 2016, 2ndEdition.

Web Resources	
1.	Refer MOOC Courses like NPTEL and SWAYAM
2.	https://www.w3schools.com/php/default.asp

Mapping with Programme Outcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	S	Credi	Inst.	Marks

							ts	Hours	CIA	External	Total
	Software Testing	Specific Elective	Y	-	-	-	2	2	25	75	100

Course Objective		
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
I	Introduction: Purpose–Productivity and Quality in Software–TestingVsDebugging–Model for Testing–Bugs–Types of Bugs – Testing and Design Style.	6	C1
II	Flow / Graphs and Path Testing – Achievable paths – Path instrumentation Application Transaction FlowTesting Techniques.	6	C2
III	Data Flow Testing Strategies - Domain Testing:Domains and Paths – Domains and Interface Testing.	6	C3
IV	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, StateTesting.	6	C5
	Total	**30**	

Course Outcomes		**Program Outcomes**
CO	On completion of this course, students will	

1	Students learn to apply software testing knowledge and engineering methods	PO1
2	Have an ability to identify the needs of software test automation, and define and develop a test tool to support test automation.	PO1, PO2
3	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
4	Have basic understanding and knowledge of contemporary issues in software testing, such as component-based software testing problems	PO4, PO5, PO6
5	Have an ability to use software testing methods and modern software testing tools for their testing projects.	PO3, PO8

Text Book	
1	B.Beizer,"SoftwareTestingTechniques",IIEdn.,DreamTechIndia,NewDelhi,2003.
2	K.V.K.Prasad,"SoftwareTestingTools",DreamTech.India,NewDelhi,2005

Reference Books	
1.	I.Burnstein,2003,"PracticalSoftwareTesting",SpringerInternationalEdn.
2.	E. Kit, 1995, "Software Testing in the Real World: Improving the Process", PearsonEducation,Delhi.
3.	R. Rajani,andP.P.Oak,2004,"SoftwareTesting",TataMcgrawHill,New Delhi.

Web Resources	
1.	https://www.javatpoint.com/software-testing-tutorial
2.	https://www.guru99.com/software-testing.html

Mapping with Programme Outcomes:

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

Weightage of course contributed to each PSO	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	Marks External	Total
	PROBLEM SOLVING TECHNIQUES	Specific Elective	Y	-	-	-	2	2	25	75	100

	Course Objective
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.

UNIT	Details	No. of Hours
I	**Introduction:** 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	**Fundamental Algorithms**: 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	**Factoring Methods**: 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 nth Fibonacci number.	6
IV	**Array Techniques**: Array order reversal – Array counting or histograming – Finding the maximum number in a set - Removal of duplicates from an ordered array - Partitioning an array – Finding the kth smallest element – Longest monotone subsequence.	6
V	**Text Processing and Pattern Searching**: Text line length adjustment – Left and right justification of text – Keyword searching in text – Text line editing – Linear pattern search. **Recursive algorithms**: Towers of Hanoi – Permutation generation.	6
	Total	**30**

Course Outcomes		Programme Outcome
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

Text Book	
1	R. G. Dromey, *How to Solve it by Computer*, Pearson India, 2007

Reference Books	
1.	George Polya, Jeremy Kilpatrick, *The Stanford Mathematics Problem Book: With Hints and Solutions*, Dover Publications, 2009 (Kindle Edition 2013).
2.	Greg W. Scragg, *Problem Solving with Computers*, Jones & Bartlett 1st edition, 1996.

Web Resources	
1.	https://www.studytonight.com/
2.	https://www.w3schools.com/

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**
CO 3	**3**	**2**	**1**	**2**	**3**	**3**
CO 4	**2**	**2**	**3**	**2**	**3**	**3**
CO 5	**2**	**3**	**1**	**2**	**3**	2
Weightage of course contributed to each PSO	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
	OFFICE AUTOMATION	Specific Elective		Y	-	-	2	2	25	75	100
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	**Introductory concepts:** Memory unit– CPU-Input Devices: Key board, Mouse and Scanner.Outputdevices:Monitor,Printer.IntroductiontoOperatingsystems&itsfeatures:DOS– UNIX–Windows. IntroductiontoProgrammingLanguages.										6
II	**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.**										6

III	**Spreadsheets:Excel–opening,enteringtextanddata,formatting,navigating;Formulas–entering,handlingand copying;Charts–creating,formatting and printing,analysistables,preparationoffinancialstatements,introductiontodataanalytics.**	6	
IV	**Database Concepts: The concept of data base management system; Data field, records, and files,Sorting and indexing data; Searching records. Designing queries, and reports; Linking of datafiles; Understanding Programming environment in DBMS; Developing menu drive applicationsinquerylanguage(MS–Access).**	6	
V	**Power point: Introduction to Power point - Features – Understanding slide typecasting & viewingslides – creating slide shows. Applying special object – including objects & pictures – Slidetransition–Animationeffects,audioinclusion,timers.**	6	
	Total	**30**	

	Course Outcomes	Programme Outcomes
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
	Text Book	
1	**PeterNorton,"IntroductiontoComputers"–TataMcGraw-Hill.**	
	Reference Books	
1.	Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, "Microsoft 2003", Tata McGrawHill.	
	Web Resources	
1.	https://www.udemy.com/course/office-automation-certificate-course/	
2.	https://www.javatpoint.com/automation-tools	

Mapping with Programme Outcomes:

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
Weightage of course contributed to each PSO	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
	Quantitative Aptitude	Specific Elective	Y	-	-	-	2	2	25	75	100
Course Objective										

	Course Objective
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 -	6	CO3

	compound interest - Logarithms - Area-Volume and surfacearea -races and Gamesofskill.		
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
	Total	**60**	

	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

	Text Book
1	"QuantitativeAptitude",R.S.AGGARWAL.,S.Chand&CompanyLtd.,

	Reference Books
1.	

	Web Resources
1.	https://www.javatpoint.com/aptitude/quantitative
2.	https://www.toppr.com/guides/quantitative-aptitude/

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

Weightage of course contributed to each PSO	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

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

UNIT	Details	No. of Hours	CO
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	**UNIT IV: MySQL:** 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	● **Introduction** –PHP Form processing – Database Access with PHP – MySQL, MySQL Functions – Inserting Records – Selecting Records – Deleting Records – Update Records.		6	C6
	Total			**30**

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

Text Book	
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.

Reference Books	
1.	Eric Rosebrock, Eric Filson, "Setting up LAMP: Getting Linux, Apache, MySQL and PHP and working together", John Wiley and Sons, 2004.
2.	2. Anthony Butcher , "Teach Yourself MySQL in 21 days", 2nd Edition, Sams Publication.

3.	3. Rich Bower, Daniel Lopez Ridreejo, Alian Liska , "Apache Administrator's Handbook", Sams Publication.
4.	4. Tammy Fox, "RedHat Enterprise Linux 5 Administration Unleashed", Sams Publication.
5.	5. Naramore Eligabette, Gerner Jason, Wrox Press, Wiley Dreamtech Press, "Beginning PHP5, Apache, MySQL Web Development", 2005.
Web Resources	
1.	Introduction to Open-Source and its benefits - GeeksforGeeks
2.	https://www.bing.com/

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	1	3	2	2	1	1
CO 2	3	1	3	2	3	3
CO 3	3	2	2	-	2	1
CO 4	2	-	3	3	3	1
CO 5	3	3	3	3	3	2
Weightage of course contributed to each PSO	12	9	13	10	12	8

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total

	Multimedia Systems	Specific Elective	Y	-	-	-	2	2	25	75	100

	Course Objective
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
I	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
II	Images: Plan Approach - Organize Tools - Configure Computer Workspace -Making Still Images - Color - Image File Formats. Sound: The Power of Sound -DigitalAudio-MidiAudio-Midivs.DigitalAudio-Multimedia SystemSoundsAudio File Formats -Vaughan's Law of Multimedia Minimums - Adding SoundtoMultimediaProject	12	C2
III	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	**Making Multimedia: The Stage of Multimedia Project - The Intangible Needs -The Hardware Needs - The Software Needs - An Authoring Systems Needs-MultimediaProductionTeam.**	12	C4
V	PlanningandCosting:TheProcessofMakingMultimedia-Scheduling-Estimating - RFPs and Bid Proposals. Designing and Producing - Content andTalent:AcquiringContent-OwnershipofContentCreatedfor Project-AcquiringTalent	12	C5
	Total	**60**	

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

1	understand the concepts, importance, application and the process of developing multimedia	PO1
2	to have basic knowledge and understanding about image related processings	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

Text Book	
1	**TayVaughan,"Multimedia:MakingItWork",8thEdition,Osborne/McGraw-Hill,2001.**
Reference Books	
1.	**RalfSteinmetz&KlaraNahrstedt"MultimediaComputing,Communication&Applications",PearsonEducation,2012.**
Web Resources	
1.	https://www.geeksforgeeks.org/multimedia-systems-with-features-or-characteristics/

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	2	3	3	2	1
CO 2	3	2	3	3	2	1
CO 3	3	2	3	3	2	1
CO 4	3	2	3	3	1	1
CO 5	3	3	3	3	1	1
Weightage of course contributed to each PSO	15	11	15	15	8	5

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

Subject Code	Subject Name	Category	L	T	P	S	Credi	Inst.	Marks

									t s	H o u r s	CI A	E x t e r n a l	Tot al
	Advanced Excel		Specific Elective	Y	-	-	-	2	2	25	75	100

Course Objective	
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

UNIT	**Details**	**No. of Hours**	**Course Objective**
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-	6	C2

	Working with Reports Creating subtotals- Multiple-level subtotal.			
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 Of Excel Sparklines, Inline Charts, data Charts- Overview of all the new features.		6	C5
	Total		**30**	

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

5	Learn No-SQL databases and management.	PO3, PO8

	Text Book
1	**Excel 2019 All**
2	**Microsoft Excel 2019 Pivot Table Data Crunching**

	Reference Books

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

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
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
CO 5	3	2	1	3	1	3
Weightage of course contributed to each PSO	14	11	8	9	8	10

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

									Marks		
Subject Code	**Subject Name**	**Category**	**L**	**T**	**P**	**S**	**Credits**	**Inst. Hours**	**CIA**	**External**	**Total**

Biometrics	Specific Elective	Y	-	-	-	2	2	25	75	100

Course Objectives	
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	**Introduction**: 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. **Face Biometrics:** 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.	6	CO1
II	**Retina and Iris Biometrics:** 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 **Vein and Fingerprint Biometrics:** Introduction, Biometrics Using Vein Pattern of Palm, Fingerprint Biometrics, Fingerprint Recognition System, Minutiae Extraction, Fingerprint Indexing, Experimental Results, Advantages and Disadvantages.	6	CO2
III	**Privacy Enhancement Using Biometrics:** Introduction, Privacy Concerns Associated with Biometric Deployments, Identity and Privacy, Privacy Concerns, Biometrics with	6	CO3

	Privacy Enhancement, Comparison of Various Biometrics in Terms of Privacy, Soft Biometrics. **Multimodal Biometrics:** 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.			
IV	**Watermarking Techniques:** 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.	6	CO4
V	**Scope and Future:** 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. **Biometric Standards:** Introduction, Standard Development Organizations, Application Programming Interface (API), Information Security and Biometric Standards, Biometric Template Interoperability.	6	CO5
	Total	**30**	
Course Outcomes			

Course Outcomes

Course Outcomes	On completion of this course, students will;	
CO1	To understand the basic concepts and the functionality of the Biometrics, Face Biometrics, Types, Architecture and Applications.	PO1, PO3, PO6, PO8
CO2	To know the concepts Retina and Iris Biometrics and Vein and Fingerprint Biometrics.	PO1,PO2,PO3,PO6

CO3	To analyse the Privacy Enhancement and Multimodal Biometrics.	PO3, PO5
CO4	To get analyticalidea on Watrmarking Techniques	PO1, PO2, PO3, PO7
CO5	To Gain knowledge on Future scope of Biometrics,and Study of various Biometric Techniques.	PO2, PO6, PO7

Recommended Text	
1.	Biometrics: Concepts and Applications by G.R Sinha and SandeepB.Patil , Wiley, 2013

References Books	
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.

Web Resources	
1.	https://www.tutorialspoint.com/biometrics/index.htm
2.	https://www.javatpoint.com/biometrics-tutorial
3.	https://www.thalesgroup.com/en/markets/digital-identity-and-security/government/inspired/biometrics

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	1	-	2	3
CO 4	3	-	3	3	3	1
CO 5	3	3	3	3	1	2
Weightage of course contributed to each PSO	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
	Cyber Forensics	Specific Elective	Y	-	-	-	2	2	25	75	100

	Course Objective
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
I	**Overview of Computer Forensics Technology:** Computer Forensics Fundamentals: What is Computer Forensics Use of ComputerForensics in Law Enforcement, Computer Forensics Assistance to HumanResources/Employment Proceedings, Computer Forensics Services, Benefits of professionalForensics Methodology, Steps taken by Computer Forensics Specialists. Types of Computer.Forensics Technology: Types of Business Computer Forensic, Technology–Types ofMilitary Computer Forensic Technology–Types of Law Enforcement–Computer Forensic. Technology–Types of Business Computer Forensic Technology.	6	C1
II	**Computer Forensics Evidence and capture:** Data Recovery: Data Recovery Defined, Data Back–up and Recovery, The Role of Back –up in Data Recovery, The Data –Recovery Solution. Evidence Collection and Data	6	C2

	Seizure: Collection Options, Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence, General Procedure, Collection and Archiving, Methods of Collections, Artefacts, Collection Steps, Controlling Contamination: The chain of custody.			
III	**Duplication and Preservation of Digital Evidence:** 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	
IV	**Computer Forensics Analysis:** Discovery of Electronic Evidence: ElectronicDocument Discovery: A Powerful New Litigation Tool. Identification of Data: Time Travel, Forensic Identification and Analysis of Technical Surveillance Devices.	6	C4	
V	**Reconstructing Past Events:** How to Become a Digital Detective, Useable File Formats,Unusable File Formats, Converting Files.Networks: Network Forensics Scenario, a technical approach, Destruction Of E–Mail, Damaging Computer Evidence, DocumentingThe Intrusion on Destruction of Data, System Testing.	6	C5	
	Total	**30**		

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
1	Understand the definition of computer forensics fundamentals.	PO1
2	Evaluate the different types of computer forensics technology.	PO1, PO2
3	Analyze various computer forensics systems.	PO4, PO6
4	Apply the methods for data recovery, evidence collection and data seizure.	PO4, PO5, PO6

5	Gain your knowledge of duplication and preservation of digital evidence.	PO3, PO8

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

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

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

Mapping with Programme Outcomes:

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
Weightage of course contributed to each PSO	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

	Pattern Recognition	Specific Elective	Y	-	-	-	2	2	75	25	100

	Course Objective										
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	**PATTERN RECOGNITION OVERVIEW**: Pattern recognition, Classification and Description-Patterns and feature Extraction with Examples-Training and Learning in PR systems-Pattern recognition Approaches	6	CO1
II	**STATISTICAL PATTERN RECOGNITION**: Introduction to statistical Pattern Recognition-supervised Learning using Parametric and Non-Parametric Approaches.	6	CO2
III	**LINEAR DISCRIMINANT FUNCTIONS AND UNSUPERVISED LEARNING AND CLUSTERING**: 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	**SYNTACTIC PATTERN RECOGNITION**: 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	**NEURAL PATTERN RECOGNITION**: Introduction to Neural Networks-Feed-forward Networks and training by Back Propagation-Content Addressable Memory Approaches and Unsupervised Learning in Neural PR	6	CO5
	Total		

Course Outcomes		Programme Outcomes
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

Text Book	
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.

Reference Books	
1.	1. Earl Gose, Richard johnsonbaugh, Steve Jost, "Pattern Recognition and Image Analysis", Prentice Hall of India, Pvt Ltd, New Delhi.

Web Resources	
1.	https://www.geeksforgeeks.org/pattern-recognition-introduction/
2.	https://www.mygreatlearning.com/blog/pattern-recognition-machine-learning/

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
Weightage of course contributed to each PSO	12	13	7	12	11	11

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	CIA	External	Total
	ERP	Specific Elective	Y	-	-	-	4	4	25	75	100

Course Objectives	
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

UNIT	Details	No. of Hours	Course Objectives
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 Man-agement (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
	Total	**30**	

Course Outcomes

Course Outcomes	On completion of this course, students will;	
CO1	Understand the basic concepts of ERP.	PO1, PO2, PO6
CO2	Identify different technologies used in ERP	PO2, PO3, 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

Reference Text :	
1.	Enterprise Resource Planning – Alexis Leon, Tata McGraw Hill.

References :	
1.	**Enterprise Resource Planning – Diversified by Alexis Leon, TMH.**
2.	**Enterprise Resource Planning – Ravi Shankar & S. Jaiswal , Galgotia**

Web Resources	
1.	1. https://www.tutorialspoint.com/management_concepts/enterprise_resource_planning.htm

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

Mapping with Programme Outcomes:

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**	**-**
Weightage of course contributed to each PSO	10	11	6	7	11	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**
	Robotics and Its Applications	Specific Elective	Y	-	-	-	2	2	25	75	100

	Course Objective		
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	6	CO1

	robotic arm, end-effectors and its types, service robot and its application, Artificial Intelligence in Robotics.		
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 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	6	CO4
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	6	CO5

	arc welding-spot welding-spray painting-assembly operation-cleaning-etc.		
	Total		

	Course Outcomes	Programme Outcomes
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
	Text Book	
1	RicharedD.Klafter. Thomas Achmielewski and MickaelNegin, Robotic Engineering and Integrated Approach, Prentice Hall India-Newdelhi-2001	
2	SaeedB.Nikku, Introduction to robotics, analysis, control and applications, Wiley-India, 2 nd edition 2011	
	Reference Books	
1.	Industrial robotic technology-programming and application by M.P.Groover et.al, McGrawhill2008	
2.	Robotics technology and flexible automation by S.R.Deb, THH-2009	
	Web Resources	
1.	https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_robotics.htm	
2.	https://www.geeksforgeeks.org/robotics-introduction/	

Mapping with Programme Outcomes:

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

Weightage of course contributed to each PSO	13	11	10	11	10	10

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	CIA	External	Total
	Simulation and Modeling	Specific Elective	Y	-	-	-	2	2	25	75	100

Course Objectives	
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	Details	No. of Hours	Course Objectives
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 Data Collection - Data Collection Problems - – Input Modeling Strategy - Histograms -Probability Distributions - Selecting a Probability Distribution.	6	CO1

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	6	CO4

	Planning – Script Programming -Script Parsing - Script Execution.		
V	Optimization Algorithms – Genetic Algorithms – Simulated Annealing Examples: Sensor Systems Modeling – Human Eye Modeling – Optical Sensor Modeling – Radar Modeling.	6	CO5
	Total	**30**	

Course Outcomes

Course Outcomes	On completion of this course, students will;	Programme Outcomes
CO1	Introduction To Modeling & Simulation, Input Data Analysis and Modeling.	PO1
CO2	Random Variate and Number Generation. Analysis of Simulations and methods.	PO1, PO2
CO3	Comparing Systems via Simulation	PO4, PO6
CO4	Entity Body Modeling, Visualization, Animation.	PO4, PO5, PO6
CO5	Algorithms and Sensor Modeling.	PO3, PO8

Text Books

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.

References Books

1.	**Andrew F. Seila, Vlatko Ceric, Pandu Tadikamalla, "Applied Simulation Modeling", Thomson Learning Inc., 2003.**

Web Resources

1.	https://www.tutorialspoint.com/modelling_and_simulation/index.htm
2.	https://www.javatpoint.com/verilog-simulation-basics

Mapping with Programme Outcomes:

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

											Marks		
CO 3		3	2	-	-	2	3						
CO 4		3	-	3	3	3	1						
CO 5		3	3	3	3	1	2						
Weightage of course contributed to each PSO		15	9	11	10	9	10						

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

Subject Code	Subject Name	Category	L	T	P	O	Credits	Inst. Hours	CIA	External	Total
										Marks	
	Organizational Behaviour	Specific Elective	Y	-	-	-	2	2	25	75	100

Learning Objectives	
LO1	To have extensive knowledge onOB and the scope of OB.
LO2	To create awareness of Individual Benaviour.
LO3	To enhance the understanding of Group Behaviour
LO4	To know the basics of Organisaitonal Culture and Organisational Structure
LO5	To understand Organisational Change, Conflict and Power

UNIT	Details	No. of Hours	Learning Objectives
I	**INTRODUCTION** : 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	**INDIVIDUAL BEHAVIOUR:** 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.	6	CO2

	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:		
III	**GROUP BEHAVIOUR** : 1. Groups and Work Teams : 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);	6	CO3
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	CO5
		30	

Course Outcomes	On Completion of the course the students will	Program Outcomes
CO1	To define OrganisationalBehaviour, Understand the opportunity through OB.	PO1, PO2, PO6, PO7
CO2	To apply self-awareness, motivation, leadership and learning theories at workplace.	PO2,PO4. PO5, PO6
CO3	To analyze the complexities and solutions of group behaviour.	PO1, PO2, PO4, PO5, PO6
CO4	To impact and bring positive change in the culture of the organisaiton.	PO2, PO3, PO4 PO5, PO8
CO5	To create a congenial climate in the organization.	PO1, PO2, PO5 PO6, PO8
Reading List		
1.	NeharikaVohra Stephen P. Robbins, Timothy A. Judge , *Organizational Behaviour*, Pearson Education, 18th Edition, 2022.	

2.	Fred Luthans, *Organizational Behaviour*, Tata McGraw Hill, 2017.
3.	Ray French, Charlotte Rayner, Gary Rees & Sally Rumbles, *Organizational Behaviour*, John Wiley & Sons, 2011
4.	Louis Bevoc, Allison Shearsett, Rachael Collinson, *Organizational Behaviour Reference*, Nutri Niche System LLC (28 April 2017)
5.	Dr. Christopher P. Neck, Jeffery D. Houghton and Emma L. Murray, *Organizational Behaviour: A Skill-Building Approach,* SAGE Publications, Inc; 2nd edition (29 November 2018).
References Books	
1.	Uma Sekaran, Organizational Behaviour Text & cases, 2nd edition, Tata McGraw Hill Publishing CO. Ltd
2.	GangadharRao, Narayana, V.S.P Rao, Organizational Behaviour 1987, Reprint 2000, Konark Publishers Pvt. Ltd, 1st 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
Weightage of course contributed to each PSO	13	11	10	10	10	11

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

Subject Code	Subject Name	Category	L	T	P	S	Cre	Marks

								dits	C I A	Ex ter nal	T o t a l
	UNDERSTANDING INTERNET	Specific Elective	2	-	-		2		25	75	100

	Learning Objectives
LO1	Knowledge of Internet medium
LO2	Internet as a mass medium
LO3	Features of Internet Technology,
LO4	Internetas sourceof infotainment
LO5	Studyofinternet audiences andabout cyber crime

UNIT	Contents	No. Of. Hours
I	**Theemergenceofinternet asamassmedium–theworld of'worldwideweb'.**	**6**
II	**Featuresofinternetasatechnology.**	**6**
III	**Internetas asourceofinfotainment – classificationbasedoncontentandstyle.**	**6**
IV	**Demographic and psychographic descriptions of internet 'audiences' – effect of internet onthevalues and life-styles.**	**6**
V	**Presentissuessuchascybercrime andfuturepossibilities.**	**6**
	TOTAL HOURS	30

	Course Outcomes	Programme Outcomes
CO	On completion of this course, students will	
CO 1	Knows the basic concept in internet Concept of mass medium and world wide web	PO1, PO2, PO3, PO4, PO5, PO6
CO 2	**Knows the concept of internet as a technology.**	PO1, PO2, PO3, PO4, PO5, PO6
CO 3	Understand the concept of infotainment and classification based on content and style	PO1, PO2, PO3, PO4, PO5, PO6
CO 4	Can be able to know about Demographic and psychographic description of internet	PO1, PO2, PO3, PO4, PO5, PO6
CO 5	Understand the concept of cyber crime and future possibilities	PO1, PO2, PO3, PO4, PO5, PO6

	Textbooks
1	01. Barnouw, E and Krishnaswamy S [1990] Indian Film. New York, OUP.
2	Kumar, Keval [1999] Mass Communication in India. Mumbai, Jaico.

3	**Srivastava, K M [1992] Media Issues. Sterling Publishers Pvt Ltd.**
	Reference Book
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.
	Web Resources
1.	https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf
2.	https://www.w3schools.com/html/default.asp

Mapping with Programme Outcomes:

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

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