

B.C.A Syllabus under CBCS Pattern with effect from 2023-2024 onwards



PERIYAR UNIVERSITY

SALEM-636011

DEGREE OF BACHELOR OF COMPUTER APPLICATION

Syllabus for

B.C.A

(SEMESTER PATTERN- CBCS)

**(For Candidates admitted in the colleges affiliated to
Periyar university from 2023-2024 onwards)**

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 Out comes-based Curriculum Framework (LOCF) which makes it student-centric, interactive and outcome-oriented with well-defined aims, objectives and goals to achieve. LOCF also aims at ensuring uniform education standard and content delivery across the state which will help the students to ensure similar quality of education irrespective of the institute and location.

Computer Application is the study of quantity, structure, space and change, focusing on problem solving, application development with wider scope of application in science, engineering, technology, social sciences etc. throughout the world in last couple of decades and it has carved out a space for itself like any other disciplines of basic science and engineering. Computer Application is a discipline that spans theory and practice and it requires thinking both in abstract terms and in concrete terms . Nowadays, practically every one 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 Outcome 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 jobs in various other public and private enterprises.

1. 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 lead 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 benefiting from knowledge and insights 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 investigation of complex problems

PO5: Modern tools usage

PO6: Applying to society

2. Programme Specific Outcomes of B.Sc. Degree Programme in Computer Science

PSO1: Think in a critical and logical based manner

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

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

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

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

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

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

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

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

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

PO/PSO	PS O1	PS O2	PS O3	PS O4	PS O5	PS O6
PO1	☐					
PO2		☐				
PO3			☐			
PO4				☐		
PO5					☐	
PO6						☐

3. Highlights of the Revamped Curriculum

- Student-centric, meeting the demands of industry & society, incorporating industrial components, hands-on training, skill enhancement modules, industrial project, project with viva-voce, exposure to entrepreneurial skills, training for competitive examinations, sustaining the quality of the core components and incorporating application oriented content wherever required.
- The Core subjects include latest developments in the education and scientific front, advanced programming packages allied with the discipline topics, practical training, devising mathematical models and algorithms for providing solutions to industry/real
- life situations. The curriculum also facilitates peer learning with advanced mathematical topics in the final semester, catering to the needs of stakeholders 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 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 incorporated as Elective courses, covering conventional topics to the latest – Statistics with R Programming, Data Science, Machine learning, Internet of Things and Artificial Intelligence etc..

4. 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 over view of the pedagogy of learning abstract Mathematics and simulating mathematical Concepts to real world.	• Instil 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 enable the students gain knowledge and exposure on latest computational aspects
		• Data analytical skills will enable students gain internships, apprenticeships, fieldwork involving data collection, compilation, analysis etc.
		• Entrepreneurial skill training will provide an opportunity for independent livelihood • Generate self-employment • Create small scale entrepreneurs • Training to girls lead to women empowerment
		• Discipline centric skill will improve the Technical know how of solving real life problems using ICT 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 sector etc. 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 • Application of the concept to real situation is conceived resulting in tangible outcome
VI Semester	Introduction of Professional Competency component	• Curriculum design accommodates all category of learners; Mathematics for Advanced Explain component will comprise of advanced topics in Mathematics 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 needs of peer learners/research aspirants

Skills acquired from the Courses	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferable Skill
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Sem I	Credit	HOURS	Sem II	Credit	HOURS	Sem III	Credit	HOURS	Sem IV	Credit	HOURS	Sem V	Credit	HOURS	Sem VI	Credit	HOURS
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	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																	

**Choice Based Credit System (CBCS), Learning Outcomes Based Curriculum Framework
(LOCF) Guideline Based Credit and Hours Distribution System
for all UG courses including Lab Hours**

First Year – Semester-I

Part	List of Courses	Credit	No. of Hours
Part-1	Language – Tamil	3	6
Part-2	English	3	6
Part-3	Core Courses & Elective Courses [in Total]	13	14
Part-4	Skill Enhancement Course SEC-1	2	2
	Foundation Course	2	2
Total	Total	23	30

Semester-II

Part	List of Courses	Credit	No. of Hours
Part-1	Language – Tamil	3	6
Part-2	English	3	6
Part-3	Core Courses & Elective Courses including laboratory [in Total]	13	14
Part-4	Skill Enhancement Course -SEC-2	2	2
	Skill Enhancement Course -SEC-3 (Discipline / Subject Specific)	2	2
Total	Total	23	30

Second Year – Semester-III

Part	List of Courses	Credit	No. of Hours
Part-1	Language - Tamil	3	6
Part-2		3	6
Part-3	Core Courses & Elective Courses including laboratory [in Total]	13	14
Part-4	Skill Enhancement Course -SEC-4 (Entrepreneurial Based)	1	1
	Skill Enhancement Course -SEC-5 (Discipline / Subject Specific)	2	2
	E.V.S	-	1
Total		22	30

Semester-IV

Part	List of Courses	Credit	No. of Hours
Part-1	Language - Tamil	3	6
Part-2	English	3	6
Part-3	Core Courses & Elective Courses including laboratory [in Total]	13	13
Part-4	Skill Enhancement Course -SEC-6 (Discipline / Subject Specific)	2	2
	Skill Enhancement Course -SEC-7 (Discipline / Subject Specific)	2	2
	E.V.S	2	1
Total		25	30

Third Year Semester-V

Part	List of Courses	Credit	No. of Hours
Part-3	Core Courses including Project / Elective Based	22	26
Part-4	Value Education	2	2
	Internship / Industrial Visit / Field Visit	2	2
Total		26	30

Semester-VI

Part	List of Courses	Credit	No. of Hours
Part-3	Core Courses including Project / Elective Based & LAB	18	28
Part-4	Extension Activity	1	-
	Professional Competency Skill	2	2
Total		21	30

Consolidated Semester wise and Component wise Credit distribution

Parts	Sem I	Sem II	Sem III	Sem IV	Sem V	Sem VI	Total Credits
Part I	3	3	3	3	-	-	12
Part II	3	3	3	3	-	-	12
Part III	13	13	13	13	22	18	92
Part IV	4	4	3	6	4	1	22
Part V	-	-	-	-	-	2	2
Total	23	23	22	25	26	21	140

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

Illustration for B.C.A.. Curriculum Design 1st Year

Semester-I

Part	Paper Code	List of Courses	Credit	Hours perweek (L/T/P)
Part-I		Language –Tamil	3	6
Part-II		English	3	6
Part-III	23UCACC01	CC1–Python Programming	5	5
	23UCACCP01	CC2-Practical: Python Programming Lab	3	3
		Elective Course – EC1 (Generic/Discipline Specific) – Choose from Annexure–I	5	6
Part-IV		Skill Enhancement Course- SEC1 (Non Major Elective)	2	2
		Foundation Course FC– Structured Programming in C	2	2
Total			23	30

Semester-II

Part	Paper Code	List of Courses	Credit	Hours perweek (L/T/P)
Part-I		Language –Tamil	3	6
Part-II		English	3	4
Part-IV	NMSDC	Overview of English Language Communication	2	2
Part-III	23UCACC02	CC3–Object Oriented Programming using C++	5	4
	23UCACCP02	CC4 –Practical:C++Programming Lab	3	3
		Elective Course –EC2 (Generic/ Discipline Specific)-Choose from Annexure-I	5	5
Part-IV		Skill Enhancement Course- SEC2 (Non Major Elective)	2	2
		Skill Enhancement Course–SEC3 Choose from Annexure-II	2	2
		Disaster Management	1	2
Total			26	30

Second Year

Semester-III

Part	Paper Code	List of Courses	Credit	Hours perweek (L/T/P)
Part-I		Language –Tamil	3	6
Part-II		English	3	6
Part-III	23UCACC03	CC5-DataStructuresandAlgorithms	4	4
	23UCACCP03	CC6-Practical: Data Structures and Algorithms using C++ Lab	3	3
		Elective Course –EC3 (Generic/ Discipline Specific)-Choose from Annexure-I	6	6
Part-IV	NMSDC	Computational Skills for Employability	2	2
		Skill Enhancement Course-SEC5– Choose from Annexure-II	2	2
		Environmental Studies	-	1
		Health and Wellness	1	
Total			24	30

Semester-IV

Part	Paper Code	List of Courses	Credit	Hours perweek (L/T/P)
Part-I		Language -Tamil	3	6
Part-II		English	3	6
Part-III	23UCACC04	CC7-ProgramminginJava	4	4
	23UCACCP04	CC8 -Practical: Programming in Java Lab	3	3
		ElectiveCourse-EC4 (Generic/Discipline Specific)–Choose from Annexure-I	6	6
Part-IV		Skill Enhancement Course–SEC6 Choose from Annexure-II	2	2
	NMSDC	UI / UX Design	2	2
		Environmental Studies	2	1
Total			25	30

Third Year

Semester-V

Part	Paper Code	List of Courses	Credit	Hours perweek (L/T/P)
Part-III	23UCACC05	CC9–Operating Systems	4	5
	23UCACC06	CC10-ASP.NetProgramming	4	5
	23UCACCP05	CC11-Practical:ASP.NetProgrammingLab	4	4
		Elective Course–EC5(Discipline Specific)– Choose from Annexure-I	3	4
		Elective Course–EC6(Discipline Specific)– Choose from Annexure-I	3	4
	23UCACCPR1	CC12-Project with Viva voce	4	4
Part-IV		Value Education	2	2
		Internship/Industrial Training (Summer vacation at the end of IV semester activity)	2	-
	NMSDC	Cloud and IT Essential for Employability	2	2
Total			28	30

Semester-VI

Part	Paper Code	List of Courses	Credit	Hours perweek (L/T/P)
Part-III	23UCACC07	CC13-ComputerNetworks	4	6
	23UCACC08	CC14–Data Analytics using R Programming	4	6
	23UCACCP06	CC15- Practical: R Programming Lab	4	6
		Elective Course–EC7(Discipline Specific) Choose from Annexure-I	3	5
		Elective Course–EC8(Discipline Specific) Choose from Annexure-I	3	5
Part-IV		Skill Enhancement Course - SEC8 Choose from Annexure II	2	2
Part-V		Extension Activity	1	-
Total			21	30

Total Credits: 147

SUGGESTED CORE COMPONENTS

S.No	Paper Code	Paper Title
1	23UCACC09	Microprocessor and Microcontroller
2	23UCACCP07	Microprocessor and Microcontroller Lab
3	23UCACC10	RDBMS with PL/SQL
4	23UCACCP08	PL/SQL Lab
5	23UCACC11	Software Engineering
6	23UCACC12	Machine Learning Techniques
7	23UCACCP09	Machine Learning Lab
8	23UCACC13	Network Security
9	23UCACC14	Data Mining and Warehousing
10	23UCACC15	Mobile Application Development
11	23UCACCP10	Mobile Application Development Lab
12	23UCACC16	Introduction to Data Science and more..

Annexure - I

Elective Course (EC1- EC8) (Generic / Discipline Specific) Generic Specific

S.No	Paper Title
1	Mathematics-I
2	Mathematics-II
3	Mathematics Practical
4	Discrete Mathematics-I
5	Discrete Mathematics-II
6	Numerical Methods
7	Optimization Techniques
8	Introduction to Linear Algebra
9	Graph Theory and its Application
10	Numerical Methods-I
11	Numerical Methods-II

12	Statistical Methods and its Application-I
13	Statistical Methods and its Application-II
14	Statistical Practical
15	Physics-I
16	Physics Practical-I
17	Physics-II
18	Physics Practical-II
19	Digital Logic Fundamentals
20	Nano Technology
21	Resource Management Techniques and more
22	Financial Accounting
23	Cost and Management Accounting

Discipline Specific

S.No	Paper Code	Paper Title
1	23UCADE01	Software Metrics
2	23UCADE02	Natural Language Processing
3	23UCADE03	Analytics for Service Industry
4	23UCADE04	Cryptography
5	23UCADE05	Database Management System
6	23UCADE06	Big Data Analytics
7	23UCADE07	IOT and its Applications
8	23UCADE08	Software Project Management
9	23UCADE09	Image Processing
10	23UCADE10	Information Security
11	23UCADE11	Human Computer Interaction
12	23UCADE12	Fuzzy Logic
13	23UCADE13	Artificial Intelligence
14	23UCADE14	Mobile Adhoc Network
15	23UCADE15	Computational Intelligence

16	23UCADE16	Grid Computing
17	23UCADE17	Cloud Computing
18	23UCADE18	Artificial Neural Network
19	23UCADE19	Agile Project Management and more..

[Pl.Note:In Semester-VI-For EC7and EC8 subjects Instructional hours may be used as:5per cycle]

Annexure-II

Skill Enhancement Course (SEC1-SEC8)

S.No	Paper Code	Paper Title
1	23UCASE01	Fundamentals of Information Technology
2	23UCASE02	Introduction to HTML
3	23UCASE03	Web Designing
4	23UCASE04	PHP Programming
5	23UCASE05	Software Testing
6	23UCASE06	Problem Solving Techniques
7	23UCASE07	Office Automation
8	23UCASE08	Quantitative Aptitude
9	23UCASE09	Open Source Software Technologies
10	23UCASE10	Multimedia Systems
11	23UCASE11	Advanced Excel
12	23UCASE12	Biometrics
13	23UCASE13	Cyber Forensics
14	23UCASE14	Pattern Recognition
15	23UCASE15	Enterprise Resource Planning
16	23UCASE16	Robotics and Applications
17	23UCASE17	Simulation and Modelling
18	23UCASE18	Organization Behavior and more..
19	23UCASE19	Understanding Internet

Note: For Semester I & II [if other department select our paper as Non Major Elective choose from the above Skill Enhancement Course]

CORE PAPER

FIRST YEAR - SEMESTER-I

Subject Code	SubjectName	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
CC1	PYTHONPROGRAMMING		5	-	-	-	5	25	75	100
LearningObjectives										
LO1	To makestudents understandthe concepts of Python programming.									
LO2	ToapplytheOOPsconceptinPYTHONprogramming.									
LO3	Toimpartknowledgeondemandandsupplyconcepts									
LO4	TomakethestudentslearnbestpracticesinPYTHONprogramming									
LO5	Toknowthecostsandprofit maximization									
UNIT	Contents									No. ofHou rs
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 –									15

	Modules and Namespace – Defining our own modules.		
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 handling 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 I, First Edition, 2017, Oxford University Press.		
2	Dr. R. Nageswara Rao, — Core Python Programming I, First Edition, 2017, Dreamtech Publishers.		
Reference Books			
1.	Vamsi Kurama, — Python Programming: A Modern Approach I, Pearson Education.		
2.	Mark Lutz, I Learning Python I, Orielly.		
3.	Adam Stewarts, — Python Programming I, Online.		
4.	Fabio Nelli, — Python Data Analytics I, A Press.		

5.	Kenneth A. Lambert, —Fundamentals of Python—First Programs, CENGAGE Publication.
WebResources	
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	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	3	3	3
CO2	3	2	2	3	2	3
CO3	3	2	2	3	2	2
CO4	3	2	2	3	2	3
CO5	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

SubjectC ode	SubjectName	Category	L	T	P	S	Credits	Marks		
								CIA	Extern al	Total
CC2	PYTHONLAB		-	-	3	-	3	25	75	100
CourseObjectives: 1. BeabletodesignandprogramPythonapplications. 2. BeabletocreateloopsanddecisionstatementsinPython. 3. BeabletoworkwithfunctionsandpassargumentsinPython. 4. BeabletobuildandpackagePythonmodulesfor reusability. 5. BeabletoreadandwritefilesinPython.										
LABEXERCISES								RequiredHou rs		
1. Programusingvariables,constants,I/OstatementsinPython. 2. ProgramusingOperatorsinPython. 3. ProgramusingConditionalStatements. 4. ProgramusingLoops. 5. ProgramusingJumpStatements. 6. ProgramusingFunctions. 7. ProgramusingRecursion. 8. ProgramusingArrays. 9. ProgramusingStrings. 10. ProgramusingModules. 11. ProgramusingLists. 12. ProgramusingTuples. 13. ProgramusingDictionaries. 14. ProgramforFileHandling.								60		
CourseOutcomes										
Oncompletionofthiscourse, studentswill										
CO1	Demonstratetheunderstandingofsyntaxandsemanticsof									
CO2	IdentifytheproblemandsolveusingPYTHONprogrammingtechniques.									
CO3	Identifysuitableprogrammingconstructsforproblemsolving.									
CO4	AnalyzevariousconceptsofPYTHONlanguagetosolvetheprobleminanefficient way.									
CO5	DevelopaPYTHONprogramforagivenproblemandtestforitscorrectness.									

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	2	2	3	2
CO2	2	1	3	2	-	2
CO3	3	3	1	1	1	2
CO4	2	3	3	1	-	1
CO5	3	2	3	1	1	-
Weightageofcourse contributed to eachPSO	12	11	12	7	5	7

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
FC	Structured Programming Language in C	FC	2	-	-	-	2	2	25	75	100
Course Objective											
LO1	To familiarize the students with the Programming basics and the fundamentals of C, Data types 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, GOT O 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,declaringandinitializingpointers,accessing avariablethroughaddressandthroughpointer,pointer expressions, pointer increments and scale factor, pointers and arrays, pointers and functions, pointers and structures.	6	CO5
	Total	30	
CourseOutcomes		ProgrammeOutcome	
CO	Oncompletionofthiscourse, studentswill		
1	RemembertheprogramstructureofCwithitssyntaxands emantics	PO1,PO3,PO5	
2	UnderstandtheprogrammingprinciplesinC(datatypes, operators, branching and looping, arrays,functions,structures, pointersandfiles)	PO2,PO3,PO6,PO7	
3	Applytheprogrammingprincipleslearntinreal- timeproblems	PO3,PO4,PO7	
4	Analyzethevariousmethodsofsolvingaproblemand choosethebestmethod	PO4,PO5,PO6	
5	Code,debugandtesttheprogramswithappropriate testcases	PO7,PO8	
TextBook			
1	E.Balagurusamy,ProgramminginANSIC,FifthEdition,TataMcGraw-Hill,2010.		
ReferenceBooks			
1.	ByronGottfried,Schaum’sOutlineProgrammingwithC,FourthEdition,TataMcGra w-Hill,2018.		
2.	KernighanandRitchie,TheCProgrammingLanguage,SecondEdition,PrenticeHall, 1998		
3.	YashavantKanetkar,LetUsC,EighteenthEdition,BPBPublications,2021		
WebResources			
1.	https://codeforwin.org/		
2.	https://www.geeksforgeeks.org/c-programming-language/		

3.	http://en.cppreference.com/w/c
4.	http://learn-c.org/
5.	https://www.cprogramming.com/

Mapping with Programme Outcomes:

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

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

SEMESTER II

Title of the Course/Paper	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
CC3	OBJECT ORIENTED PROGRAMMING CONCEPTS USING C++	Core	5	-	-	-	5	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										
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, goto, break, continue, Switch case statements - Loops in C++ :for, while, do - functions in C++ - inline functions – Function Overloading.									15	
II	Classes and Objects: Declaring Objects – Defining Member Functions – Static Member 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, Hierarchical, Hybrid, Multi path inheritance – Virtual base Classes – Abstract Classes.									15	

IV	Pointers–Declaration–PointertoClass, Object–thispointer–Pointers	15
	to derived classes andBase classes – Arrays – Characteristics – array ofclasses – Memory models – new and deleteoperators – dynamic object – Binding, PolymorphismandVirtualFunctions.	
V	Files –Filestreamclasses –filemodes–Sequential Read /Writeoperations– BinaryandASCIIFiles–RandomAccessOperation–Templates –Exception Handling- String –Declaring andInitializingstringobjects– StringAttributes– Miscellaneousfunctions.	15
	Total	75
CourseOutcomes		ProgrammeOutcome
CO	Uponcompletionofthecourse the studentswouldbe ableto:	
1	RemembertheprogramstructureofCwithitssyntaxandseman tics	PO1,PO6
2	UnderstandtheprogrammingprinciplesinC(datatypes,operat ors, branchingandlooping, arrays,functions, structures,pointersandfiles)	PO2
3	Applytheprogrammingprincipleslearntinreal- timeproblems	PO4,PO7
4	Analyzethevariousmethodsofsolvingaproblem andchoosethebestmethod	PO6
5	Code,debugandtesttheprogramswithappropriatetest cases	PO7,PO8
TextBook		
1	E.Balagurusamy,—Object-OrientedProgrammingwithC++I,TMH2013,7thEdition.	
ReferenceBooks		
1.	AshokNKamthane,—Object-OrientedProgrammingwithANSIandTurboC++I, PearsonEducation2003.	
2.	MariaLitvin&GrayLitvin,—C++foryouI,Vikaspublishation2002.	
WebResources		
1.	https://alison.com/course/introduction-to-c-plus-plus-programming	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	1	-	-	1
CO2	2	2	2	1	-	-
CO3	3	1	1	-	1	-
CO4	1	2	1	2	2	1
CO5	3	2	1	2	3	2
Weightageofcoursec ontributedtoeach PSO	12	9	6	5	6	4

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

Title of the Course/ Paper	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
CC4	C++ PROGRAMMING LAB	Core	-	-	3	-	3	3	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++ I, TMH 2013, 7th Edition.	
Reference Books		

1.	AshokNKamthane,—Object-OrientedProgrammingwithANSIandTurboC++I, PearsonEducation2003.
2.	MariaLitvin&GrayLitvin,—C++foryoull,Vikaspublishation2002.
WebResources	
1.	https://alison.com/course/introduction-to-c-plus-plus-programming

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	1	2
CO2	2	3	3	3	1	2
CO3	2	3	3	3	1	2
CO4	2	3	3	3	1	2
CO5	2	3	3	3	1	2
Weightageofcoursec ontributedtoeach PSO	11	15	15	15	5	10

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

SECOND YEAR

Semester III

Title of the Course/ Paper	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	M a r k s		
									CIA	External	Total
CC5	DATA STRUCTURES AND ALGORITHMS	Core	4	-	-	-	4	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 structures 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 implementationsingly linked lists-circular linked lists-doubly-linked lists-application of lists-Polynomial Manipulation-Alloperations-Insertion-Deletion-Merge-Traversal										15
II	Stack ADT-Operations-Applications-Evaluating arithmetic expressions – Conversion of infix to postfix expression-Queue ADT-Operations-Circular Queue-Priority Queue-deQueue application 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-Application 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-Application of graphs.										15
V	Searching- Linear search-Binary search-Sorting-Bubble sort-Selection sort-Insertion sort-Shell sort-Radix sort-Hashing-Hash functions-Separate chaining-Open Addressing-Rehashing Extendible Hashing										15
	Total										75

CourseOutcomes		ProgrammemeOutcome
CO	Oncompletionofthiscourse, studentswill	
1	Understand the concept of Dynamic memorymanagement,datatypes, algorithms,BigOnotation	PO1,PO6
2	Understandbasicdatastructuressuchasarrays,linked lists,stacksandqueues	PO2
3	Describethehashfunctionandconceptsofcollisionand itsresolutionmethods	PO2,PO4
4	Solveprobleminvolvinggraphs,treesandheaps	PO6,PO8
5	Apply Algorithm for solving problems like sorting,searching,insertionanddeletionof data	PO7
TextBook		
1	1.MarkAllenWeiss,—DataStructuresandAlgorithmAnalysisinC++ ,Pearson Education2014,4thEdition.	
2	ReemaThareja,—DataStructuresUsingCl,OxfordUniversitiesPress2014,2nd Edition	
ReferenceBooks		
1.	ThomasH.Cormen,ChalesE.Leiserson,RonaldL.Rivest,CliffordStein,—Introduction to Algorithms ,McGrawHill2009,3rdEdition.	
2.	Aho,HopcroftandUllman,—DataStructuresandAlgorithms ,PearsonEducation2003	
WebResources		
1.	NPTEL&MOOCcoursestitledDataStructures	
2.	https://nptel.ac.in/courses/106106127/	

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	-	1	-
CO2	1	2	1	-	-	-
CO3	3	1	2	1	-	-
CO4	2	2	1	-	-	1
CO5	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
CC6	DATA STRUCTURES AND ALGORITHMS LAB using C++	Core	-	-	3	-	3	3	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 structures 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 program 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 (using 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.	WriteaprogramsfortheimplementationofBFSandDFSforagivengraph.	
8	Writeaprogramsforimplementingthefollowingsearchingmethods: • Linearsearch • Binarysearch.	
9.	Writeaprogramsforimplementingthefollowingsortingmethods: • Bubblesort • Selectionsort • Insertionsort • Radixsort.	
	Total	
CourseOutcomes		ProgrammemOutcome
CO	Oncompletionofthiscourse, studentswill	
1	Understandtheconcept ofDynamicmemory management,datatypes, algorithms, BigOnotation	PO1,PO4,PO5
2	Understand basic data structures such as arrays, linkedlists,stacksandqueues	PO1,PO4,PO8
3	Describethehashfunctionandconceptsofcollisionand itsresolutionmethods	PO1,PO3,PO6
4	Solveprobleminvolvinggraphs,treesandheaps	PO3,PO4
5	Apply Algorithm for solving problems like sorting,searching,insertionanddeletionof data	PO1,PO5,PO6
TextBook		
1	MarkAllenWeiss,—DataStructuresandAlgorithmAnalysisinC++ll,Pearson Education2014,4th Edition.	
2	ReemaThareja,—DataStructuresUsingCl,OxfordUniversitiesPress2014,2nd Edition	
ReferenceBooks		
1	ThomasH.Cormen,ChalesE.Leiserson,RonaldL.Rivest,CliffordStein,—Introduction to Algorithmsll,McGrawHill2009,3rdEdition	
2.	Aho,HopcroftandUllman,—DataStructuresandAlgorithmsll,PearsonEducation2003	
WebResources		
1.	NPTEL&MOOCcoursestitledDataStructures	
2.	https://nptel.ac.in/courses/106106127/	

Mapping with Programme Outcomes:

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

SEMESTER IV

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
CC7	ProgrammingINJAVA	Core	4	-	-	-	4	4	25	75	100
CourseObjectives											
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 student 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			
I	Introduction: Review of Object Oriented concepts- History of Java- Java buzz words- JVM Architecture- Data types- Variables- Scope and lifetime of variables - arrays- operators- control statements- type conversion and casting- simple java program- constructors- methods- Static block- Static Data- Static Method String and StringBuffer Classes.							15			
II	Inheritance: Basic concepts - Types of inheritance - Member access rules- Usage of this and Super keyword- Method Overloading- Method overriding- Abstract classes - Dynamic method dispatch - Usage of final keyword. Packages: Definition- Access Protection - Importing Packages. Interfaces: Definition- Implementation- Extending							15			

	Interfaces. Exception Handling: <i>try-catch-throw - throws-finally-</i> Built-in exceptions- Creating own Exception classes.	
III	Multithreaded Programming: Thread Class- Runnable interface- Synchronization- Using synchronized methods- Using synchronized statement- Interthread Communication- Deadlock. I/O Streams: Concepts of streams- Stream classes- Byte and Character stream- Reading console input and Writing Console output- File Handling.	15
IV	AWT Controls: The AWT class hierarchy- user interface components- Labels- Button- Text Components - Check Box - Check Box Group - Choice - List Box - Panels - Scroll Pane - Menu - Scroll Bar. Working with Frame class - Colour - Fonts and layout managers. Event Handling: Events- Event sources- Event Listeners - Event Delegation Model (EDM) - Handling Mouse and Keyboard Events - Adapter classes - Inner classes	15
V	Swing: Introduction to Swing- Hierarchy of swing components. Containers- Top level containers- JFrame- JWindow - JDialog - JPanel - JButton - JToggleButton - JCheckBox- JRadioButton- JLabel, JPasswordField- JTextArea- JList- JComboBox- JScrollPane.	15
	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'Reilly 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	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	-	2	2	2
CO2	3	1	2	1	2	2
CO3	1	-	2	2	2	2
CO4	2	2	2	2	2	2
CO5	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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
CC8	Programming in java lab	Core	-	-	3	-	3	3	25	75	100
CourseObjective											
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 student to know about Event Handling.										
LO4	To enable the student to use String Concepts.										
LO5	To equip the student with programming knowledge to create 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 Character Array and perform the following string operations: a. String length b. Finding a character at a particular position c. Concatenating two strings										
6	Write a program to perform the following string operations using String class:										

	a. StringConcatenation b. Searchasubstring c. Toextractsubstringfromgivenstring	
7	WriteaprogramtoperformstringoperationsusingStringBufferclass: a. Lengthofa string b. Reverseastring c. Deleteasubstringfromthegivenstring	
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 as synchronously to print the numbers 1 to 10 using Thread1 and to print 90 to 100 using Thread2.	
10	Write a program to demonstrate the use of following exceptions. a. ArithmeticException b. NumberFormatException c. ArrayIndexOutOfBoundsException 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 adapters).	
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.	

ReferenceBooks	
1.	HeadFirstJava,O‘RiellyPublications,
2.	Y.DanielLiang, <i>IntroductiontoJavaProgramming</i> ,7thEdition,PearsonEducationIndia,2010.
WebResources	
1.	https://www.w3schools.com/java/
2.	http://java.sun.com
3.	http://www.afu.com/javafaq.html

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	1	3	2	3
CO2	3	2	1	3	1	3
CO3	3	2	1	3	2	3
CO4	3	2	1	3	2	3
CO5	3	2	1	3	2	3
Weightageofcoursecon tributedtoeach PSO	15	10	5	15	9	15

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

THIRD YEAR

SEMESTER V

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
CC9	Operating System	Core	5	-	-	-	4	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 process scheduling										
LO5	To learn about the concept of memory organization and multiprogramming										
UNIT	Details							No. of Hours			
	Introduction: operating system, history (1990 to 2000 and beyond), distributed computing, parallel computation. Process concepts: definition of process, process states- Lifecycle of a process, process management- process state transitions, process control block (PCB), process operations, suspend and resume, context switching, Interrupts- Interrupt processing, interrupt classes, Interprocess communication- signals, message passing.							15			
II	Asynchronous concurrent processes: mutual exclusion- critical section, mutual exclusion primitives, implementing mutual exclusion primitives, Peterson's algorithm, software solutions to the mutual Exclusion Problem-, n-thread mutual exclusion- Lamports Bakery Algorithm. Semaphores-							15			

	MutualexclusionwithSemaphores,threadsynchronizatio nwithsemaphores,	
	countingsemaphores,implementingsemaphores. Concurrent programming: monitors, messagepassing	
III	Deadlockandindefinitepostponement: Resourceconce pts,fournecessaryconditionsfordeadlock,deadlockpreve ntion,deadlockavoidanceandDijkstra'sBanker'salgorith m,deadlockdetection,deadlockrecovery.	15
IV	Jobandprocessorscheduling: schedulinglevels,schedul ing objectives, scheduling criteria, preemptivevsnon- preemptivescheduling,intervaltimerorinterruptingclock ,priorities,schedulingalgorithms-FIFO scheduling, RR scheduling, quantum size, SJFscheduling,SRTscheduling,HRNscheduling,multile velfeedbackqueues,Fairsharescheduling.	15

V	RealMemoryorganizationandManagement:: Memory organization, Memory management, Memoryhierarchy, Memory management strategies, contiguousvsnon-contiguousmemoryallocation,singleusercontiguousmemoryallocation,fixedpartitionmultiprogramming, variable partitionmultiprogramming, Memoryswapping Virtual Memory organization: virtual memory basicconcepts,multilevelstorageorganization, block mapping, paging basic concepts, segmentation,paging/segmentationsystems. VirtualMemoryManagement: Demand Paging,Pagereplacementstrategies	15
	Total	75
CourseOutcomes		ProgrammeOutcomes
CO	Oncompletionofthiscourse, studentswill	
1	Define the fundamentals of OS and identifytheconceptsrelevanttoprocess,processlifecycle,Scheduling Algorithms, Deadlock and Memorymanagement	PO1
2	knowthecriticalanalysisofprocessinvolvingvarious algorithms, an exposure to threads andsemaphores	PO1,PO2
3	Have a complete study about Deadlock and itsimpact over OS. Knowledge of handling Deadlockwithrespective algorithms andmeasuresto retrievefromdeadlock..	PO4,PO6
4	HavecompleteknowledgeofSchedulingAlgorithmsanditstypes.	PO4,PO5,PO6
5	understandmemoryorganizationandmanagement	PO3,PO8
TextBook		
1	H.M.Deitel,OperatingSystems,ThirdEdition,PearsonEducationAsia,2011	
ReferenceBooks		
1.	WilliamStallings,OperatingSystem:InternalsandDesign Principles,SeventhEdition, Prentice-HallofIndia,2012.	

2.	A.Silberschatz, and P.B. Galvin.,OperatingSystems Concepts, Nineth Edition, JohnWiley&Sons(ASIA)PteLtd.,2012
WebResources	
1.	
2.	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	-	1	2	-	1
CO2	2	3	1	2	-	1
CO3	3	2	-	3	-	1
CO4	1	3	1	1	3	2
CO5	3	-	1	3	2	1
Weightageofcoursec ontributedtoeach PSO	12	8	4	11	5	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
CC10	ASP.Net Programming	Core	5	-	-	-	4	5	25	75	100
Course Objective											
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 standard controls.										
LO3	To implement file handling operations.										
LO4	To handle SQL Server Database using ADO.NET.										
LO5	Understand the GridView control and XML classes.										
UNIT	Details								No. of Hours		
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 – String operations.								15		
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		
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 Deleting files – File uploading.								15		
IV	ADO.NET Overview – Database Connections – Commands – DataReader - DataAdapter - DataSets - Data Controls and								15		

	itsProperties–DataBinding	
V	Grid View control: Deleting, editing, Sorting and Paging.XMLclasses–WebformtomanipulateXMLfiles-WebsiteSecurity-Authentication-Authorization–CreatingaWebapplication.	15
	Total	75
CourseOutcomes		ProgrammeOutcome
CO	Oncompletionofthiscourse, studentswill	
1	DevelopworkingknowledgeofC#programmingco nstructsandthe.NETFramework	PO1,PO2,PO6
2	Todevelopa softwaretosolveareal- worldproblemsusingASP.NET	PO2,PO3,PO8
3	ToWorkOn VariousControlsFiles	PO1,PO3,PO7
4	TocreateawebapplicationusingMi crosoftADO.NET.	PO2,PO6
5	TodevelopwebapplicationsusingXML	PO1,PO3,PO8
TextBook		
1	SvetlinNakov,VeselinKolev&Co,FundamentalsofComputerProgrammingwithC#,Faberp ublication,2019.	
2	Mathew,MacDonald,TheCompleteReferenceASP.NET,TataMcGraw-Hill,2015.	
ReferenceBooks		
1.	HerbertSchildt,TheCompleteReferenceC#.NET,TataMcGraw-Hill,2017.	
2.	KogentLearningSolutions,C#2012ProgrammingCovers .NET4.5BlackBook,Dreamtechpres,2013.	
3.	AnneBoehm,JoelMurach,Murach’sC#2015,MikeMurach&AssociatesInc.2016.	
4.	DenielleOtey,MichaelOtey,ADO.NET:TheCompletereferece,McGrawHill,2008.	
5.	MatthewMacDonald,BeginningASP.NET4inC#2010,APRESS,2010.	
WebResources		
1.	https://www.geeksforgeeks.org/introduction-to-net-framework/	
2.	https://www.javatpoint.com/net-framework	

Mapping with Programme Outcomes:

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
CC11	ASP.NetProgrammingLAB	Core	-	-	5	-	4	5	25	75	100
CourseObjective											
LO1	TodevelopASP.NETWebapplicationusingstandardcontrols.										
LO2	TocreaterichdatabaseapplicationsusingADO.NET.										
LO3	Toimplementfilehandlingoperations.										
LO4	ToimplementXMLclasses.										
LO5	ToutilizeASP.NETsecurityfeaturesforauthenticatingthewebsite										
Sl.No	Programs										
1.	CreateanexposureofWebapplicationsandtools										
2.	ImplementtheHtmlControls										
3.	ImplementtheServerControls										
4.	WebapplicationusingWebcontrols.										
5.	WebapplicationusingListcontrols.										
6.	Web Page design using Rich control. Validate userinputusingValidationcontrols.WorkingwithFileconcepts.										
7.	WebapplicationusingDataControls.										
8.	DatabindingwithWebcontrols										
9.	DatabindingwithDataControls.										
10.	Databaseapplicationtoperforminsert,updateanddeleteoperations.										
11.	Database application using Data Controls to performinsert,delete,edit,pagingandsortingoperation.										

12.	ImplementtheXmlclasses.	
13.	ImplementAuthentication–Authorization.	
14.	TicketreservationusingASP.NET controls.	
15.	OnlineexaminationusingASP.NETcontrols	
	Total	
CourseOutcomes		ProgrammeOutcome
CO	Oncompletionofthiscourse, studentswill	
1	Tocreatewebapplicationsandimplementvariouscontrols	PO1,PO2,PO6
2	CreateawebpagesinRichcontrol.	PO3,PO8
3	Developknowledgeaboutfilehandlingoperations	PO1,PO4,PO8
4	AnabilitytodesignXMLclasses	PO2,PO6,PO7
5	Todevelopasoftwaresolovereal-worldproblemsusingASP.NET	PO1,PO3,PO5,PO8
TextBook		
1	SvetlinNakov,VeselinKolev&Co,Fundamentalsof ComputerProgrammingwithC#,Faberpublication,2019.	
2	Mathew,MacDonald,TheCompleteReferenceASP.NET,TataMcGraw-Hill,2015.	
ReferenceBooks		
1.	HerbertSchildt,TheCompleteReferenceC#.NET,TataMcGraw-Hill,2017.	
2.	KogentLearningSolutions,C#2012ProgrammingCovers.NET4.5BlackBook, Dreamtechpres,2013.	
3.	AnneBoehm,JoelMurach,Murach’sC#2015,MikeMurach&AssociatesInc.2016.	
4.	DenielleOtey,MichaelOtey,ADO.NET:TheCompletereference,McGrawHill,2008.	
5.	MatthewMacDonald,BeginningASP.NET4inC#2010,APRESS,2010.	
WebResources		
1.	https://www.geeksforgeeks.org/introduction-to-net-framework/	
2.	https://www.javatpoint.com/net-framework	

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	2	1	1
CO2	3	2	3	2	2	2
CO3	3	3	2	2	1	1
CO4	3	2	3	2	1	1
CO5	3	2	2	2	1	2
Weightageofcoursec ontributedtoeach PSO	15	11	12	10	6	7

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

SEMESTER VI

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
CC13	Computer Networks	CORE/ Elective	6	-	-	-	4	6	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 Transport 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	Togain knowledge on Telephone systems using wirelessnetwork	PO1,PO2
3	TounderstandtheconceptofMAC	PO4,PO6
4	Toanalyze the characteristics of Routing and Congestioncontrolalgorithms	PO4,PO5,PO6
5	Tounderstandnetworksecurityanddefinevarious protocolssuchasFTP,HTTP,Telnet,DNS	PO3,PO8
TextBook		
1	A.S.Tanenbaum,—ComputerNetworks,4th Edition,Prentice-HallofIndia,2008.	
ReferenceBooks		
1.	B.A.Forouzan,—DataCommunicationsandNetworking, TataMcGrawHill,4th Edition,2017	
2.	F. Halsall, —DataCommunications, ComputerNetworksandOpen Systems, PearsonEducation,2008	
3.	D.BertsekasandR.Gallagher,—DataNetworks,2ndEdition,PHI,2008.	
4.	Lamarca,—CommunicationNetworks, TataMcGraw-Hill,2002	
WebResources		
1.	https://en.wikipedia.org/wiki/Computer_network	
2.	https://citationsy.com/styles/computer-networks	

Mapping with Programme Outcomes:

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
CC14	DATA ANALYTICS USING R Programming	Core	6	-	-	-	4	6	25	75	100
CourseObjective											
LO1	Tounderstandtheproblemsolvingapproaches										
LO2	TolearnthebasicprogrammingconstructsinRProgramming										
LO3	TolearnthebasicprogrammingconstructsinRProgramming										
LO4	TouseRProgrammingdata structures-lists,tuples,anddictionaries.										
LO5	Toidinput/outputwithfilesinRProgramming.										
UNIT	Details						No.of Hours				
I	Evolution of Big data — Best Practices for Big dataAnalytics — Big data characteristics — Validating —The Promotion of the Value of Big Data — Big DataUse Cases- Characteristics of Big Data Applications —Perception and Quantification of Value -UnderstandingBig Data Storage —A General Overview of High-PerformanceArchitecture—HDFS— MapReduceandYARN— MapReduceProgrammingModel						18				

II	CONTROLSTRUCTURESANDVECTORS-Control structures,functions, scoping rules, dates and times,Introduction to Functions, preview of Some ImportantRDataStructures,Vectors,CharacterStrings,Matrices,Lists,DataFrames,ClassesVectors:Generatingsequences,Vectorsandsubscripts,Extractingelementsof avectorusingsubscripts,Workingwithlogicalsubscripts,Scalars,Vectors,Arrays,andMatrices,AddingandDeletingV ectorElements,ObtainingtheLengthofaVector,Matrices andArraysasVectorsVectorArithmeticandLogical	18
	Operations, Vector Indexing, Common VectorOperations	
III	LISTS- Lists: Creating Lists, General List Operations,ListIndexingAddingandDeletingListElements,Getting the Size of a List, Extended Example: TextConcordance Accessing List Components and ValuesApplyingFunctions to Lists, DataFrames, CreatingData Frames, Accessing Data Frames, Other Matrix-LikeOperations	18
IV	FACTORSANDTABLES-FactorsandLevels,Common Functions Used with Factors, Working withTables,Matrix/Array-LikeOperationsonTables,Extracting a Sub table, Finding the Largest Cells in aTable,MathFunctions,CalculatingaProbability,Cumulative Sums and Products, Minima and Maxima,Calculus,FunctionsforStatisticalDistributions RPROGRAMMING.	18

V	OBJECT-ORIENTED PROGRAMMING 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, S tatistical Analysis with R, data manipulation	18
	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	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	-	3	1	-
CO2	3	3	2	2	-	2
CO3	1	2	3	1	2	1
CO4	2	2	1	-	2	1
CO5	2	2	2	1	3	1
Weightageofcourse contributedtoeach PSO	11	11	8	7	8	5

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	M a r k s		
									CIA	External	Total
CC15	R Programming-LAB	Core	-	-	6	-	4	6	25	75	100
CourseObjective											
LO1	Tounderstandtheproblemsolvingapproaches										
LO2	TolearnthebasicprogrammingconstructsinRProgramming										
LO3	TopracticevariouscomputingstrategiesforRProgramming-basedsolutionstorealworldproblems										
LO4	TouseRProgrammingdata structures-lists,tuples,anddictionaries.										
LO5	Toidinput/outputwithfilesinRProgramming.										
Sl.No	Details										
1.	ProgramtoconvertthegiventemperaturefromFahrenheittoCelsiusandvice versadepending uponuser'schoice.										
2.	Program,to find the areaof rectangle,square,circle and triangle byacceptingsuitableinput parametersfromuser.										
3.	Writeaprogramtofindlist ofevennumbersfrom1tonusingR-Loops.										
4.	Createa functiontoprintsquaresofnumbersinsequence.										
5.	Writeaprogramtojoincolumnsandrowsinadata frameusingcbind()andrbind()in R.										
6.	ImplementdifferentStringManipulationfunctionsinR.										
7.	ImplementdifferentdatastructuresinR(Vectors,Lists,DataFrames)										

8	Writeaprogramtoreadacsvfileandanalyzethedatainthe fileinR.	
9	CreatepiechartandbarchartusingR.	
10	10.Createadata setanddo statisticalanalysis onthedatausingR.	
11	Programtofindfactorialofthegivennumberusingrecursivefunction	
12	WriteaRprogramtocountthenumberofevenandoddnumbersfroma rray ofNnumbers.	
	Total	
CourseOutcomes		ProgrameOutcome
CO	Oncompletionofthiscourse, studentswill	
1	AcquireprogrammingskillsincoreR Programming	PO1,PO4,PO5
2	AcquireObject-orientedprogrammingskills inRProgramming.	PO1,PO4,PO8
3	Developtheskillofdesigninggraphical-user interfaces(GUI)inRProgramming	PO1,PO3,PO6
4	AcquireRProgrammingskillstomoveinto specificbranches	PO3,PO4
5		PO1,PO5,PO6
TextBook		
1	RogerD.Peng, RProgrammingforDataScience—,2012	
2	NormanMatloff, TheArtofRProgramming-A TourofStatisticalSoftwareDesign , 2011	
ReferenceBooks		
1	GarrettGrolemund,Hadley Wickham, Hands-OnProgrammingwith R:Write YourOwn Functionsand Simulations ,1stEdition,2014	
2.	Venables,W.N.,andRipley, Sprogramming—,Springer,2000.	
WebResources		
1.	https://www.simplilearn.com	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	1	2
CO2	2	3	3	3	1	2
CO3	2	3	3	3	1	2
CO4	2	3	3	3	1	2
CO5	2	3	3	3	1	2
Weightageofcoursec ontributedtoeach PSO	11	15	15	15	5	10

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	Microprocessor and Microcontroller		5	-	-	-	4	5	25	75	100
CourseObjective											
LO1	To introduce the internal organization of Intel 8085 Microprocessor.										
LO2	To know about various instruction sets and classifications										
LO3	To enable the students to write assembly language programs using 8085.										
LO4	To interface the peripheral devices to 8085 using Interrupt controller and DMA interface.										
LO5	To provide real-life applications using microcontroller.										
UNIT	Details									No.of Hours	
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	
II	8085 Microprocessor – Pinout and Signals – Functional block diagram - 8085 Instruction Set and Classifications.									15	
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	
IV	The 8085 Interrupts – RIM and SIM instructions- 8259 Programmable Interrupt Controller- Direct Memory Access (DMA) and 8257 DMA controller.									15	

V	Introduction to Microcontroller - Microcontroller Vs Microprocessor - 8051 Microcontroller architecture -8051 pin description.Timers andCounters–OperatingModes–ControlRegisters.Interrupts–Interrupts in8051-InterruptsControlRegister–Executionofinterrupt.	15
	Total	75
CourseOutcomes		ProgrammeOutcomea
CO	Oncompletionofthiscourse, studentswill	
1	RemembertheBasicbinarycodesandtheirconversions.Bin ary concepts are used inMicroprocessorprogramming and provide a good understanding of thearchitectureof8085ointroducetheinternalorganization ofIntel8085Microprocessor..	Po1
2	Understanding the8085instruction set and theirclassifications,enablesthe studentstowritethe programs easilyontheir ownusingdifferentlogic	Po1,Po2
3	Applying different types of instructions to convert binarycodes and analyzing the outcome. The instruction set isappliedtodevelopprogramsonmultibytearithmetic operations.	Po4,Po6
4	Analyzehowperipheraldevicesareconnectedto8085 usingInterruptsandDMAcontroller.	Po4,Po5,Po6
5	Anexposuretocreaterealtimeapplicationsusing microcontroller.	Po3,Po8
TextBook		
1	R.S.Gaonkar-"MicroprocessorArchitecture-ProgrammingandApplicationswith 8085"-5thEdition-PenramInternationalPublications,2009.[ForunitItounitIV]	
2	SoumitraKumarMandal—MicroprocessorsandMicrocontrollers–Architectures, ProgrammingandInterfacingusing8085,8086,8051I,TataMcGrawHillEducation PrivateLimited.[forunitV].	
ReferenceBooks		
1.	Mathur—IntroductiontoMicroprocessorI-3rdEdition-TataMcGraw-Hill-1993.	

2.	RajKamal—Microcontrollers:Architecture,Programming,InterfacingandSystem Designl,PearsonEducation,2005.
3.	KrishnaKant,—MicroprocessorsandMicrocontrollers–Architectures,Programming andSystemDesign8085,8086,8051,8096l,PHI,2008
WebResources	
1.	WebresourcesfromNDLLibrary,E-contentfromopensourcelibraries
2.	https://www.bing.com/

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1	1	3	3	-
CO2	2	3	1	1	1	1
CO3	3	2	1	3	3	-
CO4	3	3	1	2	3	-
CO5	1	1	1	3	2	1
Weightageofcourse contributedtoeach PSO	12	10	5	12	12	2

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	Microprocessor and microcontroller Lab		-	-	4	-	4	4	25	75	100
CourseObjective											
LO1	To introduce the internal organization of Intel 8085 Microprocessor.										
LO2	To know about various instruction sets and classifications										
LO3	To enable the student to write assembly language programs using 8085.										
LO4	To interface the peripheral devices to 8085 using Interrupt controller and DMA interface.										
LO5	To provide real-life applications using microcontroller.										
	Details									No. of Hours	
	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. CodeConversion 1. BCDtoHexandHextoBCD 2. BinarytoASCIIandASCIItobinary 3. ASCIItoBCDandBCDtoASCII V. Simpleprogramson8051Microcontroller 1. Addition 2. Subtraction 3. Multiplication 4. Division 5. InterfacingExperimentsusing8051 I. RealisationofBooleanExpressionthroughports. II. Timedelaygenerationusingsubroutines. III. DisplayLEDsthroughports	
	Total	60
CourseOutcomes		ProgrammemeOutcomea
CO	Oncompletionofthiscourse, studentswill	
1	RemembertheBasicbinarycodesandtheirconversions.Bin ary concepts are used inMicroprocessorprogramming and provide a good understanding of thearchitectureof8085ointroducetheinternalorganization ofIntel8085Microprocessor..	Po1
2	Understandingthe8085instructionsetandtheir classifications,enablethestudentstowritetheprogramseasilyon their ownusingdifferentlogic	Po1,Po2
3	Applying different types of instructions to convert binarycodes and analyzing the outcome. The instruction set isappliedtodevelopprogramsonmultibytearithmetic operations.	Po4,Po6
4	Analyzehowperipheraldevicesare connectedto8085 usingInterruptsandDMAcontroller.	Po4,Po5,Po6
5	Anexposuretocreaterealttimeapplicationsusing	Po3,Po8

	microcontroller.	
TextBook		
1	R.S.Gaonkar-"MicroprocessorArchitecture-ProgrammingandApplicationswith 8085"-5thEdition-PenramInternationalPublications,2009.[ForunitIto unitIV]	
2	SoumitraKumarMandal—MicroprocessorsandMicrocontrollers–Architectures, ProgrammingandInterfacingusing8085,8086,8051I,TataMcGrawHillEducation PrivateLimited.[forunitV].	
ReferenceBooks		
1.	Mathur—IntroductiontoMicroprocessorI-3rdEdition-TataMcGraw-Hill-1993.	
2.	RajKamal—Microcontrollers:Architecture,Programming,InterfacingandSystem DesignI,PearsonEducation,2005.	
3.	KrishnaKant,—MicroprocessorsandMicrocontrollers–Architectures,Programming andSystemDesign8085,8086,8051,8096I,PHI,2008	
WebResources		
1.	WebresourcesfromNDLLibrary,E-contentfromopensourcelibraries	
2.	https://www.bing.com/	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1	1	3	3	-
CO2	2	3	1	1	1	1
CO3	3	2	1	3	3	-
CO4	3	3	1	2	3	-
CO5	1	1	1	3	2	1
Weightageofcourse contributedtoeach PSO	12	10	5	12	12	2

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	RDBMS with PL\SQL	Core	5	-	-	-	4	5	25	75	100
CourseObjective											
LO1	Describebasicconceptsof databasesystem										
LO2	DesignaData modelandSchemasinRDBMS										
LO3	CompetentinuseofSQL										
LO4	AnalyzefunctionaldependenciesfordesigningrobustDatabase										
LO5	Describebasicconceptsof databasesystem										
UNIT	Details									No. ofHours	
I	UNIT -I Introduction to DBMS– Data and Information - Database – DatabaseManagementSystem–Objectives-Advantages–Components-Architecture. ER Model: Building blocks of ER Diagram – RelationshipDegree–Classification–ERdiagramtoTables– ISArerelationship– Constraints–AggregationandComposition–Advantages									15	
II	RelationalModel:CODD’sRule-RelationalDataModel-Key-Integrity– RelationalAlgebraOperations–Advantagesandlimitations–Relational Calculus– DomainRelationalCalculus - QBE.									15	
III	Structure of Relational Database. Introduction to Relational DatabaseDesign-Objectives–Tools–RedundancyandDataAnomaly– FunctionalDependency-Normalization–1NF–2NF–3NF–BCNF. TransactionProcessing–Database Security.									15	
IV	UNIT-IV SQL:Commands–Datatypes–DDL-Selection,Projection,JoinandSet Operations–AggregateFunctions–DML–Modification-Truncation-Constraints– Subquery.									15	
V	UNIT -V PL/SQL:Structure-Elements–OperatorsPrecedence–ControlStructure– IterativeControl-Cursors-Procedure-Function-Packages–Exceptional Handling-Triggers.									15	
	Total									75	
CourseOutcomes							ProgrammeOutcome				
CO	Oncompletionofthiscourse, studentswill										
1	Understandbasicconceptsof databasesystem						PO1				
2	DesignaData modelandSchemasinRDBMS						PO1,PO2				

3	UnderstandCompetentinuseofSQL	PO4,PO6
4	Analyzefunctional dependencies for designing robustDatabase	PO4,PO5,PO6
5	Understandbasicconceptsofdatabasesystem	PO3,PO8
TextBook		
1	TEXTBOOK: 1.S.Sumathi,S.Esakkirajan,—FundamentalsofRelationalDatabaseManagement Systemll, SpringerInternationalEdition2007.	
ReferenceBooks		
1.	REFERENCEBOOKS:	
2.	1.AbrahamSilberchatz, HenryF.Korth, S.Sudarshan,—DatabaseSystemConceptsll, McGrawHill2019, 7 th Edition.	
3.	2.AlexisLeon&MathewsLeon,—FundamentalsofDBMSll, VijayNicolePublications 2014, 2 nd Edition.	
WebResources		
1.	NPTEL&MOOCcoursestitledRelationalDatabaseManagementSystems	
2.	https://nptel.ac.in/courses/106106093/	
3.	https://nptel.ac.in/courses/106106095/	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	1	3	-	-
CO2	-	-	1	-	2	2
CO3	3	2	1	3	-	-
CO4	3	-	1	-	2	2
CO5	3	2	1	3	2	2
Weightageofcourse contributedtoeach PSO	12	6	5	9	6	6

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	PL/SQLLab	Core	4	-	-	-	4	4	25	75	100
CourseObjective											
LO1	Toenablethestudentstolearnthedesiginingofdatabasesystems,foundationontherelationalmodelofdataandnormalforms.										
LO2	Tounderstoodtheconceptsofdatabasemanagementsystem,designsimpleDatabase models										
LO3	TolearnandunderstandtowritequeriesusingSQL,PL/SQL.										
LO4	Toenablethestudentstolearnthedesiginingofdatabasesystems,foundationontherelationalmodelofdataandnormalforms.										
LO5	Tounderstoodtheconceptsofdatabasemanagementsystem,designsimpleDatabase models										
	ListofExercises:							No.of Hours			
II	I. SQL 1. DDLCOMMANDS 2. DMLCOMMANDS 3. TCLCOMMANDS II. PL/SQL 4. FIBONACCISERIES 5. FACTORIAL 6. STRING REVERSE 7. SUMOFSERIES 8. TRIGGER III.CURSOR 9.STUDENT MARK ANALYSIS USINGCURSOR										

	IV. APPLICATION 10. LIBRARYMANAGEMENTSYSTEM 11. STUDENTMARKANALYSIS	
	Total	60
CourseOutcomes		ProgrammeOutcomes
CO	Oncompletionofthiscourse, studentswill	
1	Understand thevarious basicconcepts of DataBaseSystem.DifferencebetweenfilesystemandDB MS andcomparevariousdatamodels.	PO1
2	Definetheintegrityconstraints.Understandthebasicco nceptsofRelationalDataModel,Entity- RelationshipModel.	PO1,PO2
3	Design database schema considering normalizationand relationships within database. Understand andconstructdatabaseusingStructured Query Language.Attain a good practical skill of managing andretrievingofdatausingDataManipulationLanguage (DML)	PO4,PO6
4	Classifythedifferentfunctionsandvariousjoin operations andenhanace the knowledgeofhandlingmultipletables.	PO4,PO5,PO6
5	LearntodesignDatabaseoperationsandimplementusi ng PL/SQL programs. Learn basics of PL/SQLanddevelopprogramsusingCursors,Exceptio ns	PO3,PO8
TextBook		
1	Coronel,Morris,Rob,"DatabaseSystems,Design, ImplementationandManagement", NinthEdition	
2	NileshShah,"DatabaseSystemsUsingOracle",2ndedition,PearsonEducationIndia, 2016	
ReferenceBooks		
1.	Abraham Silberschatz, Henry F.Korth and S.Sudarshan,—Database System ConceptsI,McGrawHillInternationalPublication,VIEdition	
2.	ShioKumarSingh,—DatabaseSystems—,Pearsonpublications,IIEdition	

WebResources	
1.	WebresourcesfromNDLLibrary,E-contentfromopen-sourcelibraries

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	1	2
CO2	2	3	3	3	1	2
CO3	2	3	3	3	1	2
CO4	2	2	2	3	1	2
CO5	2	3	3	3	1	2
Weightageofcoursecon tributedtoeach PSO	11	14	14	15	5	10

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	SoftwareEngineering	Core	5	-	-	-	4	5	25	75	100
CourseObjectives											
LO1	Gainbasicknowledgeofanalysisanddesignofsystems										
LO2	Abilitytoapplysoftwareengineeringprinciplesandtechniques										
LO3	Modelareliableandcost-effectivesoftwaresystem										
LO4	Abilitytodesignaneffectivemodelofthesystem										
LO5	PerformTestingatvariouslevelsandproduceanefficientsystem.										
UNIT	Details							No. ofHours			
I	Introduction:Thesoftwareengineeringdiscipline,prograsvs.softwareproducts,whystudysoftwareengineering,emergenceofsoftwareengineering,Notablechangesinsoftwaredevelopmentpractices,computersystemsengineering. SoftwareLifeCycleModels:Whyusealifecyclemodel,Classicalwaterfallmodel,iterativewaterfallmodel,prototypingmodel,evolutionarymodel,spiralmodel,comparisonofdifferentlifecyclemodels.							15			
II	RequirementsAnalysisandSpecification:Requirementsgatheringandanalysis,Softwarerequirementsspecification (SRS) Software Design: Good software design, cohesion andcoupling, neat arrangement, software design approaches,object-orientedvsfunction-orienteddesign							15			

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; component based GUI development, a user interface methodology.	15
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.	15
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;	15
	Total	75
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	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	3	2	1	-
CO2	3	-	1	-	-	2
CO3	1	2	3	2	2	1
CO4	3	-	2	2	-	1
CO5	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

SubjectC ode	SubjectName	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	MACHINE LEARNING TECHNIQUES	Core	5	-	-	-	4	25	75	100
LearningObjectives										
LO1	ToLearnaboutMachineIntelligenceandMachineLearningapplications									
LO2	Toimplementandapplymachinelearningalgorithmstoreal-worldapplications									
LO3	Toidentifyandapplytheappropriatemachinelearningtechniquetoclassification, patternrecognition,optimizationanddecisionproblems									
LO4	Tocreateinstantbasedlearning									
LO5	Toapplyadvancedlearning									
UNIT	Contents								No. Of.Ho urs	
I	IntroductionMachineLearning- Difference betweenAI,MachineLearning and Big data. Supervised and unsupervised learning, parametricvsnon-parametricmodels,parametricmodelsforclassificationandregression- LinearRegression,LogisticRegression,NaïveBayesclassifier,simplenon-parametricclassifier-K-nearestneighbour,support vectormachines								15	
II	NeuralnetworksandgeneticalgorithmsNeuralNetworkRepresentation – Problems –Perceptrons –Multilayer Networks andBackPropagationAlgorithms– AdvancedTopics–GeneticAlgorithms– HypothesisSpaceSearch–GeneticProgramming–ModelsofEvaluation andLearning.								15	
III	BayesianandcomputationallearningBayesTheorem–ConceptLearning– MaximumLikelihood–MinimumDescriptionLengthPrinciple – Bayes Optimal Classifier – Gibbs Algorithm – Naïve BayesClassifier – Bayesian Belief Network–EMAlgorithm –ProbabilityLearning– SampleComplexity–FiniteandInfiniteHypothesis Spaces – MistakeBoundModel.								15	
IV	InstantbasedlearningK-NearestNeighbourLearning– LocallyweightedRegression–RadialBasisFunctions–CaseBasedLearning.								15	
V	AdvancedlearningRecommendationsystems– opinionmining,sentimentanalysis.LearningSetsofRules– SequentialCoveringAlgorithm – Learning Rule Set – First Order Rules – Sets of First OrderRules–InductiononInvertedDeduction– InvertingResolution–AnalyticalLearning–PerfectDomainTheories– ExplanationBaseLearning–FOCLAlgorithm–ReinforcementLearning– Task-Q-Learning–TemporalDifferenceLearning.								15	
TOTALHOURS								75		

CourseOutcomes		Programme Outcomes
CO	Oncompletionofthiscourse, studentswill	
CO1	Appreciatetheimportanceofvisualizationinthedataanalyticssolution	PO1, PO2,PO3, PO4,PO5, PO6
CO2	Applystructuredthinkingtounstructuredproblems	PO1, PO2,PO3, PO4,PO5, PO6
CO3	Understandaverybroadcollectionofmachinelearningalgorithmsandproblems	PO1,PO2, PO3,PO4,PO5 ,PO6
CO4	Learnalgorithmictopicsofmachinelearningandmathematicallydeepenoughtointroducetherequiredtheory	PO1,PO2, PO3,PO4,PO5 ,PO6
CO5	Developanappreciationforwhatisinvolvedinlearningfromdata.	PO1,PO2,PO3 ,PO4, PO5,PO6
Textbooks		
1	TomM. Mitchell, —Machine Learning,McGraw-Hill Education(India)Private Limited,2013.	
2	Bengio,Yoshua,IanJ.Goodfellow,andAaronCourville."Deeplearning"2015,MIT Press	
ReferenceBooks		
1.	EthemAlpaydin,—IntroductiontoMachineLearning(AdaptiveComputationand MachineLearning),TheMITPress2004.	
2	StephenMarsland,—MachineLearning:AnAlgorithmicPerspective,CRCPress, 2009.	

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	3	3	2	3
CO3	3	3	3	3	3	3
CO4	3	3	2	3	3	3
CO5	3	3	3	3	3	2
Weightage of course credit 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		-	-	4	-	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	
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									60	

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	Network Security		5	-	-	-	4	5	25	75	100
CourseObjectives											
LO1	Tofamiliarizeonthemodelofnetworksecurity,Encryptiontechniques										
LO2	TounderstandtheconceptofNumberTheory,theorems										
LO3	Tounderstandthedesignconceptofcryptographyandauthentication										
LO4	Todevelopexperimentsonalgorithmusedforsecurity										
LO5	Tounderstandaboutvirusandthreats,firewalls,andimplementationofCryptography										
UNIT	Details							No. ofHours			
I	Model of network security – Security attacks, servicesand attacks –OSI security architecture – Classicalencryptiontechniques–SDES– BlockcipherPrinciplesDES–StrengthofDES– Blockcipherdesignprinciples–Block cipher mode of operation –Evaluation criteria for AES – RC4 - Differential andlinearcryptanalysis– Placementofencryptionfunction –trafficconfidentiality.							15			
II	NumberTheory–Primenumber–Modulararithmetic– Euclid’salgorithm–Fermet’sandEuler’s theorem – Primality –Chineseremaindertheorem– Discretelogarithm–Publickeycryptography and RSA – Key distribution –Keymanagement– DiffieHellmankeyexchange– Ellipticcurvecryptography							15			
III	Authenticationrequirement–Authenticationfunction– MAC–Hashfunction–Securityofhashfunctionand MAC–SHA-HMAC–CMAC-Digitalsignature							15			

	and authentication protocols–DSS.	
IV	Authentication applications – Kerberos – X.509 Authentication services-E-mail security–IP security -Web security	15
V	Intruder – Intrusion detection system – Virus and related threats–Countermeasures– Firewalls design principles–Trusted systems– Practical implementation of cryptography and security	15
	Total	75
Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Analyze and design classical encryption techniques and block ciphers.	PO1,PO3,PO6,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.		
2.	Bruce Schneier, Neils Ferguson,—Practical Cryptography, Wiley Dreamtech India Pvt Ltd, First Edition, 2003.	
3.	Douglas R Simson—Cryptography– Theory and practice, CRC Press, First Edition, 1995	

WebResources	
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/

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	2	1	1	1
CO2	2	-	2	2	2	1
CO3	3	2	2	2	1	-
CO4	3	2	3	1	1	-
CO5	3	2	2	1	3	1
Weightageofcourse contributedtoeach PSO	14	8	11	7	8	3

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	Data Mining And Warehousing		5	-	-	-	4	5	25	75	100
CourseObjectives											
LO1	To provide the knowledge on Data Mining and Warehousing concepts and techniques										
LO2	To study the basic concepts of Data Mining, Architecture and Comparison.										
LO3	To study a set of Mining Association Rules, Data Warehouses.										
LO4	To study about Classification and Prediction, Classifier Accuracy										
LO5	To study the basic concepts of cluster analysis, Cluster Methods										
UNIT	Details							No. of Hours	Course Objectives		
I	Introduction: Data mining – Functionalities – Classification – Introduction to Data Warehousing – Data Preprocessing: Preprocessing the Data – Data cleaning – Data Integration and Transformation – Data Reduction							15	CO1		
II	Data Mining, Primitives, Languages and System Architecture: Data Mining – Primitives – Data Mining Query Language, Architecture of Data Mining Systems. Concept Description, Characterization and Comparison: Concept Description, Data Generalization and Summarization, Analytical Characterization, Mining Class Comparison – Statistical Measures.							15	CO2		
III	Mining Association Rules: Basic Concepts – Single Dimensional Boolean Association Rules From Transaction Databases, Multilevel Association Rules from transaction databases – Multi dimension Association Rules from Relational Database and Data							15	CO3		

	Warehouses.		
IV	ClassificationandPrediction:Introduction–Issues– DecisionTreeInduction–BayesianClassification– Classification of Back Propagation. Classification basedon ConceptsfromAssociationRuleMining– OtherMethods.Prediction–Introduction– ClassifierAccuracy	15	CO4
V	Cluster Analysis: Introduction – Types of DatainClusterAnalysis,PetitioningMethods– HierarchicalMethods-DensityBasedMethods– GRIDBasedMethod–ModelbasedClusteringMethod	15	CO5
	Total	75	
CourseOutcomes			
CourseOut comes	Oncompletionofthiscourse,studentswill;		
CO1	Tounderstand thebasicconceptsand thefunctionality of thevariousdatamininganddatawarehousingcomponent	PO1,PO3,PO6,PO8	
CO2	To know the concepts of Data mining system architectures	PO1,PO2,PO3,PO6	
CO3	Toanalyzetheprinciplesofassociationrules	PO3,PO5	
CO4	TogetanalyticalideaonClassificationandpredictionmethods	PO1,PO2,PO3,PO7	
CO5	ToGainknowledgeonClusteranalysisanditsmethods.	PO2,PO6,PO7	
TextBooks (LatestEditions)			
1.	HanandM.Kamber,—DataMiningConceptsandTechniquesI,2001,Harcourt IndiaPvt.Ltd,NewDelhi.		
ReferencesBooks (Latesteditions)			
1.	K.P.Soman,ShyamDiwakar,V.Ajay—InsightintoDataMiningTheoryand Practice—,PrenticeHallofIndiaPvt.Ltd,NewDelhi		

2.	ParteekBhatia, DataMiningandDataWarehousing:PrinciplesandPracticalTechniques', CambridgeUniversity Press,2019
WebResources	
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

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	2	3	2	2
CO3	2	2	-	3	-	3
CO4	3	3	2	3	1	1
CO5	1	3	3	3	3	2
Weightageofcourse contributedtoeach PSO	12	14	10	15	9	11

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	<u>MOBILEAPPLICATIONDEVELOPMENT</u>		5	-	-	-	4	25	75	100
LearningObjectives										
LO1	Developin-depthKnowledgeaboutthearchitectureandfeaturesofAndroid									
LO2	Implementingthevariousoptionsavailableinviews.									
LO3	Understandthehandlingconceptsandtherebyenablingtomanagedataefficiently.									
LO4	AbletodescribeclearlythefeaturesofSMSmessaging.									
LO5	IllustratetheconceptsofLocationBasedServices									
UNIT	Contents								No. Of.Hours	
I	Android Fundamentals: Android overview and Versions –Features ofAndroid – Architecture of Android - Setting up Android Environment(Eclipse/AndroidStudio,SDK,AVD)- AnatomyofanAndroidApplication-SimpleAndroidApplicationDevelopment.								15	
II	AndroidUserInterface:Layouts:Linear,Relative,FrameandScrollview-Managing changes to Screen Orientation. Views: TextView,Button, ImageButton, EditText, CheckBox, RadioButton, RadioGroup,ProgressBar,AutoCompleteTextView,ListViewsandWebVie w								15	
III	Data Persistence: Saving and Loading User Preferences. File Handling:FileSystem-InternalandExternalStorage-Permissions-FileManipulation-ManagingDatausingSqlite:Creationofdatabase-Insertion,RetrievalandUpdationofrecords.								15	
IV	SMSMessaging:SendingandReceivingmessages-SendingE-mail–Networking:DownloadingBinaryData–DownloadingTextFiles.								15	
V	Location Based Services: Displaying maps- Displaying zoom control- Changing view – Adding Markers- Getting the location – Geo-codingPublishingAndroidApplications:Preparingforpublishing-DeployingAPKFiles.								15	
TOTALHOURS								75		
CourseOutcomes								ProgrammeOutcomes		
CO	Oncompletionofthiscourse, studentswill									
CO1	Appreciatetheimportanceofvisualizationinthedataanalyticssolution								PO1, PO2,PO3, PO4,PO5, PO6	

CO2	Apply structured thinking to unstructured problems	PO1, PO2,PO3, PO4,PO5, PO6
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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 deepen enough to introduce the required theory	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Develop an appreciation for what is involved in learning from data.	PO1, PO2, PO3, PO4, PO5, PO6
Textbooks		
1	Wei Meng Lee (2012), —Beginning Android Application Development, Wrox Publications (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	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	-	1	1	1	2
CO2	2	1	-	1	2	2
CO3	3	-	1	1	2	3
CO4	2	2	1	1	1	2
CO5	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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	<u>MOBILEAPPLICATIONDEVELOPMENTLAB</u>		4	-	-	-	4	25	75	100
CourseObjectives: - Toexplainuserdefinedfunctionsandthe concepts of class. - Todemonstratethecreationcookiesandsessions - TofacilitatethecreationofDatabaseandvalidatetheuserinputs										
LabExercises									RequiredHours	
1. DevelopanapplicationforSimpleCounter. 2. Develop an applicationtodisplayyour personaldetails using GUIComponents. 3. Developa SimpleCalculatorthatusesradiobuttonsandtextview. 4. DevelopanapplicationthatusesIntentandActivity. 5. DevelopanapplicationthatusesDialogBoxes. 6. Developanapplicationtodisplaya SplashScreen. 7. DevelopanapplicationthatusesLayoutManagers. 8. DevelopanapplicationthatusesdifferenttypesofMenus. 9. Developanapplicationthatusestosendmessagesfromonemobiletoanothermobile. 10. Developanapplicationthatusesto sendE-mail.DevelopanapplicationthatplaysAudioand Video. 11. DevelopanapplicationthatusesLocalFileStorage. 12. DevelopanapplicationforSimpleAnimation. 13. DevelopanapplicationforLoginPageusingSqlite. 14. DevelopanapplicationforStudentMarksheetprocessingusingSqlite.									60	
CourseOutcomes										
CO	Oncompletionofthiscourse, studentswill									
CO1	Tounderstandtheconceptsofcounter,dialogs.									

CO2	ConceptsofLayoutManagers.PerformsendingemailonaudioandvideoToenabletheapplicationsofaudioandvideo.
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CO3	ToapplyLocalFileStorageandDevelopmentoffiles.
CO4	TodeterminetheconceptsofSimple AnimationToapplysearchingpages.
CO5	UsageofStudentmarksheet-preparationinMAD. ConceptsofprocessingSqliteareimplemented.

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	-	3	3	2
CO2	2	1	-	3	3	3
CO3	3	-	1	2	3	3
CO4	2	3	2	3	2	3
CO5	2	2	-	3	3	3
Weightageofcoursec ontributed to eachPSO	11	8	3	14	14	14

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Introduction to Data Science		5	-	-	-	4	5	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										15
	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	CasestudyinDataScience.	PO3,PO8
TextBook		
1	DavyCielen,ArnoD.B.Meysman,MohamedAli,—IntroducingDataScienceI, manningpublications2016	
ReferenceBooks		
1.	RogerPeng,—TheArtofDataScienceI,lulu.com2016.	
2.	MurtazaHaider,—GettingStartedwithDataScience–MakingSenseofDatawith AnalyticsI,IBMpress,E-book.	
3.	DavyCielen,ArnoD.B.Meysman,MohamedAli,—IntroducingDataScience:Big Data,MachineLearning,andMore,UsingPythonToolsI,DreamtechPress2016.	
4.	AnnalynNg,KennethSoo,—Numsense!DataSciencefortheLayman:NoMath AddedI,2017,1stEdition.	
5.	CathyO'Neil,RachelSchutt,—DoingDataScienceStraightTalkfromtheFrontlineI, O'ReillyMedia2013.	
6.	LillianPierson,—DataScienceforDummiesI,2017IIEdition	
WebResources		
1.	https://www.w3schools.com/datascience/	
2.	https://en.wikipedia.org/wiki/Data_science	
3.	http://www.cmap.polytechnique.fr/~lepenne/en/post/references/refs/	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	1	2	2	-
CO2	2	3	2	2	-	1
CO3	3	2	2	1	1	3
CO4	1	2	2	1	3	1
CO5	2	2	-	3	1	1
Weightageofcourse contributedtoeach PSO	11	11	7	9	7	6

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

SOFTWARE METRICS

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
	6	-	-	-	5	6	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							12	
II	A Goal-Based Framework For Software Measurement: Classifying software measures, Determining what to Measure, Applying the framework, Software measurement validation, Performing Software Measurement Validation Empirical investigation: Principles of Empirical Studies, Planning Experiments, Planning case studies as quasi-experiments, Relevant and Meaningful Studies							12	
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 analysis techniques							12	
IV	Measuring internal product attributes: Size Properties of Software Size, Code size, Design size, Requirements analysis and Specifications size, Functionalsize measures and estimators, Applications of sizemeasures Measuring internal product attributes: Structure: Aspects of Structural Measures, Control flow structure of program units, Design-level Attributes, Object-oriented Structural attributes and measures							12	

V	Measuring External Product Attributes: Modelling software quality, Measuring aspects of quality, Usability Measures, Maintainability measures, Security Measures Software Reliability: Measurement and Prediction: Basics of reliability theory, The software reliability problem, Parametric reliability growth models, Predictive accuracy	12
TOTAL		60
CO	Course Outcomes	
CO1	Understand various fundamentals of measurement and software metrics	
CO2	Identify framework 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		
1.	https://lansa.com/blog/general/what-are-software-metrics-how-can-i-measure-these-metrics/	
2.	https://stackify.com/track-software-metrics/	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	-	3	3	2
CO2	3	1	2	3	3	3
CO3	3	1	1	2	3	3
CO4	2	3	2	3	2	3
CO5	2	2	-	3	3	3
Weightageofcoursec ontributedtoeach PSO	12	9	5	14	14	14

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	NATURAL LANGUAGE PROCESSING	Elect	4	-	-	-	3	25	75	100
Learning Objectives										
LO1	To understand approaches to syntax and semantics in NLP.									
LO2	To learn natural language processing and to learn how to apply basic algorithms in this field.									
LO3	To understand approaches to discourse, generation, dialogue and summarization within NLP.									
LO4	To get acquainted with the algorithmic description of the main language levels: morphology, syntax, semantics, pragmatic etc.									
LO5	To understand current methods for statistical approaches to machine translation.									
UNIT	Contents								No. Of. Hours	
I	Introduction : Natural Language Processing tasks in syntax, semantics, and pragmatics – Issue- Applications – The role of machine learning – Probability Basics – Information theory – Collocations -N-gram Language Models – Estimating parameters and smoothing – Evaluating language models.								12	
II	Word level and Syntactic Analysis: Word Level Analysis: Regular Expressions-Finite-State Automata-Morphological Parsing-Spelling Error Detection and correction- Words and Word classes-Part-of-Speech Tagging. Syntactic Analysis: Context-free Grammar-Constituency-Parsing-Probabilistic Parsing.								12	
III	Semantic analysis and Discourse Processing: Semantic Analysis: Meaning Representation-Lexical Semantics-Ambiguity-Word Sense Disambiguation. Discourse Processing: cohesion-Reference Resolution-Discourse Coherence and Structure.								12	
IV	Natural Language Generation: Architecture of NLG Systems-Generation Tasks and Representations- Application of NLG. Machine Translation: Problems in Machine Translation. Characteristics of Indian Languages- Machine Translation Approaches- Translation involving Indian Languages.								12	
V	Information retrieval and lexical resources: Information Retrieval:									

	Design features of Information Retrieval Systems-Classical, Non-classical, Alternative Models of Information Retrieval – valuation Lexical Resources: WorldNet-FrameNetStemmers-POSTagger-ResearchCorporaSSAS.	12
TOTAL		60
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Describe the fundamental concepts and techniques of natural language processing. Explain the advantages and disadvantages of different NLP technologies and their applicability in different business situations.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Distinguish among the various techniques, taking into account the assumptions, strengths, and weaknesses of each Use NLP technologies to explore and gain a broad understanding 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	Analyse 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 I, 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 I, Springer	
Web Resources		
1.	https://en.wikipedia.org/wiki/Natural_language_processing	

2.	https://www.techtarget.com/searchenterpriseai/definition/natural-language-processing-NLP
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Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	1
CO2	2	3	3	3	2	3
CO3	1	3	3	3	1	3
CO4	3	2	1	3	2	3
CO5	3	3	3	3	3	3
Weightage of course contributed to each PSO	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	6	-	-	-	5	25	75	100
Learning Objectives										
LO1	Recognize challenges in dealing with datasets in service industry.									
LO2	Identify and apply appropriate algorithms for analyzing the healthcare, Human resource, hospitality and tourism data.									
LO3	Make choices for a model for new machine learning tasks.									
LO4	To identify employees with high attrition risk.									
LO5	To Prioritize various talent management initiatives for your organization.									
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- Genomic Data Analysis for Personalized Medicine. Review of Clinical Prediction Models.								12	
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.								12	
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.								12	
IV	Performance Analysis: Predicting employee performance, Training requirements, evaluating training and development, Optimizing selection and promotion decisions.								12	

V	Tourism and Hospitality Analytics: Guest Analytics – Loyalty Analytics – Customer Satisfaction – Dynamic Pricing – optimized disruption management – Fraud detection in payments.	12
TOTAL HOURS		60
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
CO5	Instill a sense of ethical decision-making and a commitment to the long-run welfare of both organizations and the communities they serve.	PO1, PO2, PO3, PO4, PO5, PO6
Textbooks		
1	Chandan K. Reddy and Charu C Aggarwal, — Health care 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-enz Jac (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	Rajendra Sahu, 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-enz Jac, 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
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Mapping with Programme Outcomes:

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

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	CRYPTOGRAPHY	Elect	6	-	-	-	5	25	75	100
LearningObjectives										
LO1	TounderstandthefundamentalsofCryptography									
LO2	Toacquireknowledgeonstandardalgorithmsusedtoprovideconfidentiality,integrityandauthenticity.									
LO3	Tounderstandthevariouskeydistributionandmanagementschemes.									
LO4	Tounderstandhowtodeployencryptiontechniquessecuredataintransitacrossdatanetworks									
LO5	TodesignsecurityapplicationsinthefieldofInformationtechnology									
UNIT	Contents								No.Of. Hours	
I	Introduction:TheOSIsecurityArchitecture–SecurityAttacks–SecurityMechanisms–SecurityServices–AmodelfornetworkSecurity.								12	
II	Classical Encryption Techniques: Symmetric cipher model – SubstitutionTechniques:CaesarCipher–Monoalphabeticcipher–Playfaircipher–PolyAlphabeticCipher–Transpositiontechniques–Stenography								12	
III	BlockCipherandDES:BlockCipherPrinciples–DES–TheStrengthofDES–RSA:TheRSAalgorithm.								12	
IV	NetworkSecurityPractices:IPSecurityoverview-IPSecurityarchitecture–AuthenticationHeader. WebSecurity:SecureSocketLayerandTransportLayerSecurity–SecureElectronicTransaction.								12	
V	Intruders–Malicioussoftware–Firewalls.								12	
TOTALHOURS								60		
CourseOutcomes								Programme Outcomes		
CO	Oncompletionofthiscourse, studentswill									
CO1	Analyzehevulnerabilitiesinanycomputingsystemandhencebeabletodesignasecurity solution.								PO1, PO2,PO3, PO4,PO5, PO6	
CO2	Apply the different cryptographic operations of symmetriccryptographicalgorithms								PO1, PO2,PO3, PO4,PO5, PO6	
CO3	Applythedifferentcryptographicoperationsofpublickeycryptography								PO1,PO2, PO3,PO4,	

		PO5,PO6
CO4	Apply the various Authentication schemes to simulated 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 and Practices.	
Reference Books		
1.	Behrouz A. Foruzan,—Cryptography and Network Security, Tata McGraw-Hill, 2007.	
2	Atul Kahate,—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	PSO1	PSO2	PSO3	PSO4		PSO6
CO1	3	3	1	2		2
CO2	3	2	3	2		3
CO3	2	3	2	2		1
CO4	2	3	3	1		3
CO5	3	2	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	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Database Management System	Core	6	-	-	-	5	6	25	75	100
Course Objective											
LO1	To enable the student to learn the designing of database systems, foundation on the relational model of data and normal forms.										
LO2	To understand the concepts of database management system, design simple Database models										
LO3	To learn and understand to write queries using SQL, PL/SQL.										
LO4	To enable the student to learn the designing of database systems, foundation on the relational model of data and normal forms.										
LO5	To understand the concepts of database management system, design simple Database models										
UNIT	Details							No. of Hours			
	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							12			
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							12			
III	Normalization of Database Tables: Database tables							12			

	and Normalization – The Need for Normalization – TheNormalizationProcess–HigherlevelNormalForm. IntroductiontoSQL: DataDefinitionCommands–DataManipulationCommands–SELECTQueries–AdditionalDataDefinitionCommands–AdditionalSELECTQueryKeywords–JoiningDatabaseTables.	
IV	Advanced SQL: Relational SET Operators: UNION – UNIONALL–INTERSECT-MINUS.SQLJoin Operators: Cross Join – Natural Join – Join USINGClause – JOIN ON Clause – Outer Join. Sub Queriesand Correlated Queries: WHERE – IN – HAVING –ANY and ALL – FROM. SQL Functions: Date andTimeFunction–NumericFunction–StringFunction–ConversionFunction	12
V	PL/SQL: AProgrammingLanguage:History–Fundamentals – Block Structure – Comments – DataTypes – Other Data Types – Variable Declaration – Assignment operation –Arithmetic operators. ControlStructures and Embedded SQL: Control Structures –NestedBlocks–SQLinPL/SQL–DataManipulation – Transaction Control statements. PL/SQL Cursorsand Exceptions: Cursors – Implicit Cursors, ExplicitCursorsandAttributes–CursorFORloops–SELECT...FOR UPDATE – WHERE CURRENT OFclause – Cursor with Parameters – Cursor Variables –Exceptions–TypesofExceptions.	12
	Total	60
CourseOutcomes		ProgrammeOutcomes
CO	Oncompletionofthiscourse, studentswill	
1	UnderstandthevariousbasicconceptsofDataBase System.DifferencebetweenfilesystemandDBMS	PO1

	and compare various data models.	
2	Define the integrity constraints. Understand the basic concepts of Relational Data Model, Entity-Relationship Model.	PO1, PO2
3	Design database schema considering normalization and relationships within database. Understand and construct database using Structured Query Language. Attain a good practical skill of managing and retrieving of data using Data Manipulation Language (DML)	PO4, PO6
4	Classify the different functions and various join operations and enhance the knowledge of handling multiple tables.	PO4, PO5, PO6
5	Learn to design Database 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 I, McGraw Hill International Publication, VI Edition	
2.	Shio Kumar Singh, —Database Systems—, Pearson publications, II Edition	
Web Resources		
1.	Web resources from NDLLibrary, E-content from open-source libraries	

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
C01	3	3	3	3	3	3
C02	3	3	3	3	2	3
C03	3	3	3	3	3	3
C04	3	3	2	3	3	3
C05	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		6	-	-	-	5	6	25	75	100
Course Objective											
LO1	Understand the Big Data Platform and its Use cases, MapReduce 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 concept of NoSQL Databases										
UNIT	Details							No. of Hours			
I	Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating — The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications — Perception and Quantification of Value - Understanding Big Data Storage — A General Overview of High-Performance Architecture — HDFS — MapReduce and YARN — MapReduce Programming Model							12			
II	Advanced Analytical Theory and Methods: Overview of Clustering — K-means — Use Cases — Overview of the Method — Determining the Number of Clusters — Diagnostics — Reasons to Choose and Cautions .- Classification: Decision Trees — Overview of a Decision Tree — The General Algorithm — Decision Tree Algorithms — Evaluating a Decision Tree — Decision Trees in R — Naïve Bayes — Bayes Theorem — Naïve Bayes Classifier.							12			

III	AdvancedAnalyticalTheoryandMethods:Association	12
	Rules—Overview—AprioriAlgorithm— EvaluationofCandidateRules— ApplicationsofAssociationRules— FindingAssociation&findingsimilarity — Recommendation System: CollaborativeRecommendation- Content Based Recommendation — KnowledgeBasedRecommendation-Hybrid RecommendationApproaches.	
IV	IntroductiontoStreamsConcepts— StreamDataModelandArchitecture— StreamComputing,Sampling Data in a Stream — Filtering Streams —Counting Distinct Elements in a Stream — Estimatingmoments— CountingonenessinaWindow—DecayingWindow— RealtimeAnalyticsPlatform(RTAP) applications — Case Studies — RealTime Sentiment Analysis, Stock Market Predictions.UsingGraphAnalyticsforBigData:GraphAn alytics	12
V	NoSQL Databases : Schema-less Models: IncreasingFlexibility for Data Manipulation-Key Value Stores-Document Stores — Tabular Stores — Object DataStores—GraphDatabasesHive—Sharding—Hbase — Analyzing big data with twitter — Big data for E- Commerce Big data for blogs — Review of Basic DataAnalyticMethodsusingR.	12
	Total	60
	CourseOutcomes	ProgrammeOutcomes
CO	Oncompletionofthiscourse, studentswill	

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	Anand Rajaraman and Jeffrey David Ullman, — Mining of Massive Datasets II, 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/Elsevier 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	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	3	2	2	3	1
CO2	3	2	3	2	3	3
CO3	1	3	2	2	2	1
CO4	3	3	3	1	3	3
CO5	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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	Internet of Things and its applications		6	-	-	-	5	6	25	75	100
CourseObjective											
LO1	UseofDevices,GatewaysandDataManagementinIoT.										
LO2	DesignIoTApplicationsindifferentdomainandbeabletoanalyzetheirperformance										
LO3	ImplementbasicIoTApplicationsonembeddedplatform										
LO4	TogainknowledgeonIndustryInternetofThings										
LO5	ToLearnabouttheprivacyandSecurityissuesinIoT										
UNIT	Details						No. ofHours				
I	IoT&WebTechnology,TheInternetofThingsToday,TimeforConvergence,TowardsstheIoTUniverse,Internet of Things Vision, IoT Strategic Research andInnovationDirections,IoTApplications,FutureInternetTechnologies,Infrastructure,NetworksandCommunication,Processes,DataManagement,Security, Privacy&Trust,DeviceLevelEnergyIssues,IoTRelatedStandardization,Recommendationson ResearchTopics.						12				
II	M2MtoIoT–ABasicPerspective– Introduction,SomeDefinitions,M2MValueChains,IoTValueChains, An emerging industrial structure for IoT, Theinternationaldrivenglobalvaluechainandglobalinformationmonopolies.M2MtoIoT- AnArchitecturalOverview– Buildinganarchitecture,Maindesignprinciplesandneededcapabilities,AnIoTarchitecture outline,standardsconsiderations.						12				

III	IoT Architecture -State of the Art – Introduction, State of the art, Architecture. Reference Model- Introduction, Reference Model and architecture, IoT Reference Model, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views	12
IV	IoT Applications for Value Creation Introduction, IoT Applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management	12
V	Internet of Things Privacy, Security and Governance Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security	12
	Total	60
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
1	Work with big data tools and its analysis techniques.	PO1
2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO2
3	Learn and apply different mining algorithms and recommendations 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) I, 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 da Costa, —Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, Apress Publications 2013, 1st Edition,.
3	Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice" 4.. Cuno Pfister, —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	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	-	-	2	-	2
CO2	2	1	-	1	3	1
CO3	3	-	1	1	-	1
CO4	2	-	-	2	1	2
CO5	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

Subject Code		SubjectName		L	T	P	S	Credits	Inst. Hours	Marks		
		SOFTWARE PROJECT MANAGEMENT								CIA	External	Total
				6	-	-	-	5	6	25	75	100
	LearningObjectives											
LO1		Todefineandhighlightimportanceofsoftware projectmanagement.										
LO2		Toformulateanddefinethesoftwaremanagementmetrics& strategyinmanagingprojects										
LO3												
LO4		Understandtoapplysoftwaretestingtechniquesincommercialenvironment										
Unit		Contents										No.of Hours
I		Introduction to Competencies - Product Development Techniques - Management Skills - Product Development Life Cycle - SoftwareDevelopmentProcessandmodels-TheSEICMM-International OrganizationforStandardization.										12
II		Managing Domain Processes - Project Selection Models - ProjectPortfolio Management- Financial Processes- Selecting a ProjectTeam - Goal and Scope of the Software Project -Project Planning -Creating the Work Breakdown Structure - Approaches to Building aWBS-ProjectMilestones-WorkPackages-BuildingaWBSfor Software.										12
III		Tasks and Activities - Software Size and Reuse Estimating - TheSEICMM-ProblemsandRisks-CostEstimation- EffortMeasures-COCOMO:ARegressionModel-COCOMOII - SLIM:AMathematicalModel-OrganizationalPlanning-Project RolesandSkillsNeeded.										12
IV		Project Management Resource Activities - Organizational Form andStructure - Software Development Dependencies - Brainstorming -Scheduling Fundamentals - PERTand CPM - Leveling ResourceAssignments-MaptheScheduletoaRealCalendar-CriticalChain Scheduling.										12
V		Quality: Requirements – The SEI CMM - Guidelines - Challenges - QualityFunctionDeployment-BuildingtheSoftwareQualityAssurance - Plan - Software Configuration Management: Principles - Requirements-PlanningandOrganizing-Tools-Benefits-Legal IssuesinSoftware-CaseStudy										12
	TOTAL										60	
CO		CourseOutcomes										
CO1		Understandtheprinciplesandconceptsofprojectmanagement										
CO2		Knowledgegainedtotrainsoftwareproject 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 I, Pearson Education Asia 2002.
Reference Books	
1.	Pankaj Jalote, — Software Project Management in Practice I, Addison Wesley 2002.
2.	Hughes, — Software Project Management I, 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	PSO2	PSO3	PSO4	PSO5	PSO6
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
Weightage of course contributed to each PSO	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	6	-	-	-	5	6	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										12
II	2D Image transforms: Properties of 2D-DFT- Walsh transform- Hadamard transform- Haar transform- Discrete Cosine Transform- Karhunen-Loeve Transform- Singular Value Decomposition										12
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.										12
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.										12

V	ImageCompression:Needfor compression-Redundancy-Classification ofimage-Compressionschemes-Huffmancoding-Arithmeticcoding-Dictionarybasedcompression-Transformbasedcompression,	12
	Total	60
CourseOutcomes		ProgrammeOutcome
CO	Oncompletionofthiscourse, studentswill	
1	Understand the fundamental concepts of digitalimageprocessing.	PO1
2	Understandvarious2DImagetransformations	PO1,PO2
3	Understandimageenhancementprocessing techniquesandfilters	PO4,PO6
4	Understandtheclassification of Imagesegmentationtechniques	PO4,PO5,PO6
5	Understandvariousimagecompressiontechniques	PO3,PO8
TextBook		
1	SJayaraman,SEsakkirajan,TVeerakumar,Digitalimageprocessing,TataMcGrawHill,2015	
2	GonzalezRafelC,DigitalImageProcessing,PearsonEducation,2009	
ReferenceBooks		
1.	1.JainAnilK,Fundamentalsofdigitalimageprocessing:,PHI,1988	
2.	KennethRCastleman,Digitalimageprocessing:,PearsonEducation,2/e,2003	
3.	PrattWilliamK,DigitalImageProcessing:.,JohnWiley,4/e,2007	
WebResources		
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%203rd%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	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	3	2	2	3	1
CO2	3	2	3	2	3	3
CO3	3	3	2	2	2	1
CO4	3	3	3	1	3	3
CO5	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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	Information Security	Elective	6	-	-	-	5	6	25	75	100
CourseObjectives											
LO1	Toknowtheobjectivesofinformationsecurity										
LO2	Understandthe importance andapplicationofeachofconfidentiality,integrity,authenticationand availability										
LO3	Understandvariouscryptographicalgorithms										
LO4	Understandthebasiccategoriesofthreatstocomputersandnetworks										
LO5	Tostudyabouttheconceptsofsecurityinnetworks,websecurity										
UNIT	Details						No.ofHours				
I	IntroductiontoInformationSecurity:Securitymindset, ComputerSecurityConcepts(CIA),Attacks,Vulnerabi litiesandprotections,SecurityGoals,SecurityServices, Threats,Attacks,Assets, malware,programanalysisandmechanisms						12				
II	TheSecurityProblemInComputing:Themeaningof computerSecurity,ComputerCriminals,Methodsof Defense.Cryptography:ConceptsandTechniques:I ntroduction,plaintextandciphertext,substitutiontec hniques,transpositiontechniques,encryptionandde cryption						12				
III	SymmetricandAsymmetricCryptographicTechniques: DES,AES,RSAlgorithms .AuthenticationandDigitalSignatures:UseofCryptograp hyforauthentication,Secure Hashfunction,Keymanagement–Kerberos						12				

IV	Program Security : Non-malicious Program errors – Bufferoverflow,Incompletemediation,Time-of-check to Time-of- use Errors, Viruses, Trapdoors,Salami attack, Man-in-the- middle attacks, Covertchannels.FileprotectionMechanisms,UserAuthenticationDesigningTrustedO.S:Securitypolicies,modelsofsecurity,trustedO.Sdesign,AssuranceintrustedO.S.Implementationexamples	12
V	SecurityinNetworks:Threatsinnetworks,Network SecurityControls– Architecture,Encryption,ContentIntegrity,Strong Authentication,AccessControls,WirelessSecurity, Honeypots, Traffic flow security. WebSecurity:Websecurityconsiderations,SecureSocketLayerandTransportLayerSecurity,Secureelectronictransaction	12
	Total	60
CourseOutcomes		
CourseOutcomes	Oncompletionofthiscourse, studentswill;	ProgrammeOutcomes
CO1	Understand network security threats, security services,andcountermeasures	PO1
CO2	Understand vulnerability analysis of network security	PO1,PO2
CO3	Acquirebackgroundonhashfunctions;authentication;firewalls;intrusiondetectiontechniques	PO4,PO6
CO4	Gainhands-onexperiencewithprogrammingandsimulationtechniquesforsecurityprotocols.	PO4,PO5,PO6
CO5	Applymethodsforauthentication,accesscontrol, intrusiondetectionandprevention	PO3,PO8
TextBooks		
(LatestEditions)		

1.	SecurityinComputing,FourthEdition,byCharlesP.Pfleeger,PearsonEducation
2.	CryptographyAndNetworkSecurityPrinciplesAndPractice,FourthorFifthEdition,Wil liamStallings,Pearson
ReferencesBooks	
(Latesteditions,andthestyleasgivenbelowmustbestrictlyadheredto)	
1.	CryptographyandNetworkSecurity:CKShyamala,NHarini,DrTR Padmanabhan,WileyIndia,1stEdition
2.	CryptographyandNetworkSecurity:ForouzanMukhopadhyay,McGraw Hill,2"dEdition
3.	InformationSecurity,PrinciplesandPractice:MarkStamp,WileyIndia
4.	PrinciplesofComputerScurity:WM.ArthurConklin,GregWhite,TMH
WebResources	
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.

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	1	2	3	2
CO2	2	-	1	-	3	2
CO3	-	3	1	3	-	-
CO4	2	3	1	3	3	-
CO5	2	3	1	3	3	2
Weightageofcoursec ontributed to eachPSO	8	12	5	11	12	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
	Human Computer Interaction	Elective	6	-	-	-	5	6	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									12	
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									12	

III	MODELS AND THEORIES: - HCI Models : Cognitive models:-Socio-Organizational issues and stakeholder requirements - Communication and collaboration models-Hypertext, Multimedia and WWW.	12
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	12
V	WEB INTERFACE DESIGN: Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow -Case Studies	12
	Total	60
Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
1	Understand the fundamentals of HCI.	PO1
2	Understand the design and software process technologies.	PO1, PO2
3	Understand HCI models and theories.	PO4, PO6
4	Understand Mobile Ecosystem, types of Mobile Applications, mobile Architecture and design.	PO4, PO5, PO6
5	Understand the various types of Web Interface Design.	PO3, PO8
Text Book		
1	Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, Human-Computer Interaction II, III Edition, Pearson Education, 2004 (UNIT I, II & III)	
2	Brian Fling, — Mobile Design and Development II, I Edition, O'Reilly Media Inc., 2009 (UNIT – IV)	

3	BillScottandTheresaNeil,—DesigningWebInterfacesI,FirstEdition,O_Reilly,
	2009.(UNIT-V)
ReferenceBooks	
1.	Shneiderman,—DesigningtheUserInterface:StrategiesforEffectiveHuman-Computer InteractionII,VEdition,PearsonEducation.
WebResources	
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

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	-	1	2	1	2
CO2	2	1	2	1	3	1
CO3	3	2	1	1	-	1
CO4	2	-	3	2	1	3
CO5	2	3	-	2	3	2
Weightageofcoursecon tributedtoeach PSO	11	6	7	8	8	9

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	FuzzyLogic	Elective	6	-	-	-	5	6	25	75	100
CourseObjective											
LO1	Tounderstandthebasic conceptofFuzzylogic										
LO2	Tolearnthevariousoperationsonrelationproperties										
LO3	Tostudyaboutthemembershipfunctions										
LO4	TolearnabouttheDefuzzificationandFuzzyRule-BasedSystem										
LO5	TolearntheconceptsofApplicationsofFuzzyLogic										
UNIT	Details						No. ofHours				
I	Introduction toFuzzy Logic- FuzzySets- FuzzySetOperations,PropertiesofFuzzySets,ClassicalandFuzzyRelations:Introduction-CartesianProductofRelation-ClassicalRelations-CardinalityofCrispRelation.						12				
II	OperationsonCrispRelation-PropertiesofCrispRelations-Composition Fuzzy Relations, Cardinality ofFuzzyRelations-OperationsonFuzzyRelations-Properties of Fuzzy Relations-Fuzzy Cartesian ProductandComposition-ToleranceandEquivalenceRelations ,CrispRelation.						12				
III	MembershipFunctions:Introduction,FeaturesofMembers hipFunction,ClassificationofFuzzySets,Fuzzification,M embershipValueAssignments,Intuition, Inference,RankOrdering.						12				

IV	Defuzzification: Introduction, Lambda Cuts for FuzzySets, Lambda Cuts for Fuzzy Relations, DefuzzificationMethods,FuzzyRule-BasedSystem:Introduction,FormationofRules,DecompositionofRules,AggregationofFuzzyRules,PropertiesofSetofRules.	12
V	ApplicationsofFuzzyLogic:FuzzyLogicinAutomotiveApplications,FuzzyAntilockBrakeSystem-Antilock-Braking System and Vehicle Speed-EstimationUsing FuzzyLogic.	12
	TOTAL	60
CourseOutcomes		ProgrammeOutcomes
CO	Oncompletionofthiscourse, studentswill	
1	UnderstandthebasicsofFuzzy sets,operationand properties.	PO1
2	ApplyCartesianproductandcompositiononFuzzyrelations and usethe tolerance and Equivalencerelations.	PO1,PO2
3	Analyzevariousfuzzificationmethodsandfeaturesof membershipFunctions.	PO4,PO6
4	Evaluatedefuzzificationmethodsforrealtimeapplications.	PO4,PO5,PO6
5	DesignanapplicationusingFuzzylogicanditsRelations.	PO3,PO8
TextBook		
1	S.N.Sivanandam,S.SumathiandS.N.Deepa-IntroductiontoFuzzyLogicusingMATLAB,Springer-VerlagBerlinHeidelberg2007.	
ReferenceBooks		
1.	GuanrongChenandTrungTatPham-IntroductiontoFuzzySets,FuzzyLogicandFuzzyControlSystems	

2.	TimothyJRoss,FuzzyLogicwithEngineeringApplications
WebResources	
1.	https://www.javatpoint.com/fuzzy-logic
2.	https://www.guru99.com/what-is-fuzzy-logic.html

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	2	2	1	1
CO2	3	2	3	2	3	3
CO3	3	3	2	2	2	3
CO4	2	3	1	1	3	3
CO5	3	2	3	3	3	3
Weightageofcourse contributedtoeach PSO	13	13	11	10	12	13

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	Artificial Intelligence	Elective	6	-	-	-	5	6	25	75	100
CourseObjective											
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										12
II	Search Algorithms: Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search, A* algorithm, Game Search										12
III	Probabilistic Reasoning: Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference, temporal model, hidden Markov model.										12
IV	Markov Decision process : MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable MDPs.										12
V	Reinforcement Learning: Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning-Q learning										12
	Total										60
Course Outcomes							Programme Outcome				
CO	On completion of this course, students will										

1	Understand the various concepts of AI Techniques.	PO1
2	Understand various Search Algorithm in AI.	PO1, PO2
3	Understand probabilistic reasoning and models in AI.	PO4, PO6
4	Understand Markov Decision Process.	PO4, PO5, PO6
5	Understand various type of Reinforcement learning Techniques.	PO3, PO8
Text Book		
1	Stuart Russell and Peter Norvig, — Artificial Intelligence: A Modern Approach I, 3rd Edition, Prentice Hall.	
	Elaine Rich and Kevin Knight, — Artificial Intelligence I, Tata McGraw Hill	
Reference Books		
1.	Trivedi, M.C., — A Classical Approach to Artificial Intelligence I, Khanna Publishing House, Delhi.	
2.	Saroj Kaushik, — Artificial Intelligence I, Cengage Learning India, 2011	
3.	David Poole and Alan Mackworth, — Artificial Intelligence: Foundations for Computational Agents I, Cambridge University Press 2010	
Web Resources		
1.	NPTEL & MOOC courses titled Artificial Intelligence and Expert Systems	
2.	https://nptel.ac.in/courses/106106140/	
3.	https://nptel.ac.in/courses/106106126/	

Mapping with Programme Outcomes:

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	Mobile Ad-hocNetwork	Elective	6	-	-	-	5	5	25	75	100
CourseObjective											
LO1	TolearnaboutbasicsconceptsofAd-hocnetwork models.										
LO2	TolearnaboutMediumAccessProtocols(MAC).										
LO3	TolearnaboutNetworkRoutingProtocolsandAlgorithms.										
LO4	TolearnaboutDeliveryandSecurityinTransportLayer.										
LO5	Tolearnaboutcrosslayerdesignandoptimizationtechniques,Integrationofad-hoc withMobileIPnetworks.										
UNIT	Details									No.of Hours	
I	Introduction: Introduction to ad-hoc networks – definition, characteristics features, applications. Characteristics of wireless channel, ad-hoc mobility models in indoor and out-door models.									12	
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.									12	
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.									12	
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.									12	

V	Need for cross layer design, cross layer optimization, parameter optimization techniques, cross layer cautionary perspective. Integration of ad-hoc with Mobile IP networks.	12
	Total	60
Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
1	Understand the basic 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, Fekri M. 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.html?id=GnkcHEsxAigC
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Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	-	3	3	1
CO2	2	1	2	3	3	-
CO3	3	2	1	2	3	3
CO4	3	3	2	3	2	-
CO5	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
	Computational Intelligence	Elective	6	-	-	-	5	6	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 Artificial Neural Network										
LO5	To study about the Genetic Algorithm.										
UNIT	Details						No. of Hours				
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 techniques: Generate and Test – Types of Hill Climbing.						12				
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.						12				
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						12				

	NeuralNetwork,IntroductiontoAssociativeMemory,	
	Adaptive Resonance theory and Self Organizing Map,RecentApplications	
IV	ArtificialNeuralNetworks: FundamentalConcepts – Basic Models of Artificial Neural Networks – ImportantTerminologiesofANNs–McCulloch- PittsNeuron–LinearSeparability–HebbNetwork.	12
V	Genetic Algorithm: Introduction– BiologicalBackground – Genetic Algorithm Vs TraditionalAlgorithm– BasicTerminologiesinGeneticAlgorithm– SimpleGA– GeneralGeneticAlgorithm– OperatorsinGeneticAlgorithm	12
	Total	60
CourseOutcomes		ProgrammeOutcomes
CO	Oncompletionofthiscourse, studentswill	
1	Describethefundamentalsofartificialintelligenceconceptsandsearchingtechniques.	PO1
2	Developthefuzzylogicsetsandmembershipfunctionanddefuzzificationtechniques.	PO1,PO2
3	Understand theconceptsof Neural Networkandanalyzeandapplythelearningtechniques	PO4,PO6
4	Understandtheartificialneuralnetworksanditsapplications	PO4,PO5,PO6
5	Understand theconceptof GeneticAlgorithm andAnalyze theoptimizationproblemsusingGAs.	PO3,PO8
TextBook		
1	S.N.SivanandamandS.N.Deepa,—PrinciplesofSoftComputingI,2ndEdition,Wiley IndiaPvt.Ltd.	
2	StuartRussellandPeterNorvig,—ArtificialIntelligence-AModernApproachII,2nd Edition,Pearson Educationin Asia.	

3	S.Rajasekaran,G.A.Vijayalakshmi,—NeuralNetworks,FuzzyLogicandGenetic Algorithms:Synthesis&Applications,PHI.
ReferenceBooks	
1.	F.Martin,Mcneill,andEllenThro,—FuzzyLogic:APracticalapproach,AP Professional,2000.ChinTeng Lin,C.S.GeorgeLee, Neuro-Fuzzy Systems,PHI
2.	ChinTengLin,C.S.GeorgeLee, Neuro-FuzzySystems,PHI.
WebResources	
1.	https://www.javatpoint.com/artificial-intelligence-tutorial
2.	https://www.w3schools.com/ai/

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	2	2	-	1
CO2	3	2	3	2	3	3
CO3	3	1	2	2	2	3
CO4	2	3	-	1	3	-
CO5	3	2	3	3	3	3
Weightageofcoursecon tributed to eachPSO	13	11	10	10	11	10

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	Grid Computing	Elective	6	-	-	-	5	6	25	75	100
CourseObjective											
LO1	TolearnthebasicconstructionandapplicationofGridcomputing.										
LO2	TolearngridcomputingorganizationandtheirRole.										
LO3	TolearnGridComputingAnotomy.										
LO4	TolearnGridComputingroadmap.										
LO5	TolearnvarioustypeofGridArchitecture.										
UNIT	Details									No. ofHou rs	
I	Introduction:EarlyGridActivity,CurrentGridActivity,OverviewofGridBus inessareas,GridApplications, GridInfrastructures.									12	
II	Grid Computing organization and their Roles: Organizations DevelopingGridStandards,andBestPracticeGuidelines,GlobalGridForum (GCF),#OrganizationDevelopingGridComputingToolkitsandFramework #, Organization and building and using grid based solutionstosolvecomputing,commercialorganizationbuildingandGridBas ed solutions.									12	
III	Grid Computing Anatomy: The Grid Problem, The conceptual of virtualorganizations, # Grid Architecture # and relationship to other distributedtechnology.									12	
IV	The Grid Computing Road Map: Autonomic computing, Business ondemand and infrastructure virtualization, Service-Oriented ArchitectureandGrid,#SemanticGrids#.									12	
V	MergingtheGridservicesArchitecturewiththeWebServicesArchitecture: Service-Oriented Architecture, Web Service Architecture,#XMLmessagesandEnveloping#, Servicemessagesdescriptio nMechanisms,RelationshipbetweenWebServicesandGridServices, WebservicesInteroperabilityandtheroleoftheWS-IOrganization.									12	
	Total									60	
CourseOutcomes							ProgrammeOutcome				
CO	Oncompletionofthiscourse, studentswill										

1	To understand the basic elements and concepts of Grid computing.	PO1
2	To understand the Grid computing toolkits and Framework.	PO1, PO2
3	To understand the concepts of Anatomy of Grid Computing.	PO4, PO6
4	To understand the concept of service oriented architecture.	PO4, PO5, PO6
5	To Gain knowledge on grid and web service architecture.	PO3, PO8
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	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	1	2	1	2
CO2	2	1	2	1	3	1
CO3	3	2	1	1	-	1
CO4	3	-	3	2	1	3
CO5	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	6	-	-	-	5	6	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.										12
II	Cloud Services Compute Services: Amazon Elastic Computer Cloud - Google Compute Engine - Windows Azure Virtual Machines Storage Services: Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage Database Services: Amazon Relational Data Store - Amazon DynamoDB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database - Windows Azure Table Service Application Services: Application Runtimes and Frameworks - Queuing Services - Email Services - Notification Services - Media Services Content Delivery Services: Amazon CloudFront - Windows Azure Content Delivery Network Analytics Services: Amazon Elastic MapReduce - Google MapReduce Service - Google BigQuery - Windows Azure HD Insight										12

	DeploymentandManagementServices:AmazonElasticBeanstack- AmazonCloudFormation IdentityandAccessManagementServices:AmazonIdenti andAccessManagement-WindowsAzureActiveDirectory OpenSource Private Cloud Software: CloudStack– Eucalyptus - OpenStack	
III	Cloud Application Design: Introduction – Design Consideration forCloudApplications–Scalability–ReliabilityandAvailability–Security – Maintenance and Upgradation – Performance – ReferenceArchitecturesforCloudApplications– CloudApplicationDesignMethodologies:ServiceOrientedArchitecture(S OA),CloudComponentModel,IaaS,PaaSandSaaSforCloudAppli cations, Model View Controller (MVC), RESTful Web Services –Data Storage Approaches: Relational Approach (SQL), Non- RelationalApproach(NoSQL).	12
IV	CloudApplicationBenchmarkingandTuning: IntroductiontoBenchmar king – Steps in Benchmarking – Workload Characteristics – ApplicationPerformanceMetrics– DesignConsiderationforBenchmarkingMethodology– BenchmarkingToolsandTypesofTests – DeploymentPrototyping. Cloud Security: Introduction – CSA Cloud Security Architecture – Authentication(SSO)–Authorization–IdentityandAccessManagement – Data Security : Securing data at rest, securing data inmotion – KeyManagement–Auditing.	12
V	Case Studies: Cloud Computing for Healthcare – Cloud Computing forEnergy Systems - Cloud Computing for Transportation Systems - CloudComputingforManufacturingIndustry- CloudComputingforEducation.	12
	Total	60
	CourseOutcomes	ProgrammeOutcome
CO	Oncompletionofthiscourse, studentswill	
1	UnderstandthefundamentalconceptsandTechnologiesi nCloudComputing.	PO1
2	Able to understandvarious cloudservicetypes andtheirusesand 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
TextBook		
1	Arshdeep Bahga, Vijay Madisetti, <i>Cloud Computing – A Hands On Approach</i> , Universities Press (India) Pvt. Ltd., 2018	
Reference Books		
1.	Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, <i>Cloud Computing: A Practical Approach</i> , Tata McGraw-Hill, 2013.	
2.	Barrie Sosinsky, <i>Cloud Computing Bible</i> , Wiley India Pvt. Ltd., 2013.	
3.	David Crookes, <i>Cloud Computing in Easy Steps</i> , Tata McGraw Hill, 2015.	
4.	Dr. Kumar Saurabh, <i>Cloud Computing</i> , Wiley India, Second Edition 2012.	
WebResources		
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	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	2	3	3	1
CO2	3	1	2	3	3	-
CO3	3	2	1	2	1	3
CO4	3	3	2	3	2	-
CO5	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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	Artificial Neural Networks		6	-	-	-	5	6	25	75	100
CourseObjective											
LO1	Understand thebasicsofartificialneuralnetworks,learningprocess,singlelayer andmulti-layerperceptronnetworks.										
LO2	UnderstandtheErrorCorrectionandvariouslearningalgorithmsandtasks.										
LO3	IdentifythevariousSingleLayerPerceptionLearningAlgorithm.										
LO4	IdentifythevariousMulti-LayerPerceptionNetwork.										
LO5	Analyze theDeepLearningofvariousNeuralnetworkanditsApplications.										
UNIT	Details									No. ofHours	
I	ArtificialNeuralModel-Activationfunctions-FeedforwardandFeedback, Convex Sets, Convex Hull and Linear Separability, Non-Linear Separable Problem - Multilayer Networks. Learning Algorithms- Errorcorrection-GradientDescentRules,PerceptionLearning Algorithm,PerceptionConvergenceTheorem.									12	
II	Introduction,Errorcorrectionlearning,Memory-basedlearning,Hebbianlearning,Competitivelearning,Boltzmannlearning ,creditassignmentproblem,Learningwithandwithoutteacher,learningtasks , MemoryandAdaptation.									12	
III	.SinglelayerPerception:Introduction,PatternRecognition,Linearclassifier, Simple perception, Perception learning algorithm, ModifiedPerception learning algorithm, Adaptive linear combiner, Continuousperception, Learningincontinuousperception.LimitationofPercep tion.									12	

IV	Multi-LayerPerceptionNetworks:Introduction,MLP with2hidden layers,SimplelayerofaMLP,Deltalearningruleoftheoutputlayer,	12
	Multilayerfeedforwardneuralnetworkwithcontinuousperceptions, Generalizeddeltalearningrule,Backpropagationalgorithm	
V	Deep learning- Introduction- Neuro architectures building blocks for theDL techniques, Deep Learning and Neocognitron, Deep ConvolutionalNeural Networks, Recurrent Neural Networks (RNN), feature extraction,DeepBeliefNetworks,RestrictedBoltzmanMachines,Trainingof fDNN andApplications	12
	Total	60
CourseOutcomes		ProgrammeOutcome
CO	Oncompletionofthiscourse, studentswill	
1	Studentswilllearnthebasicsofartificialneuralnetworks with single layer and multi-layer perceptionnetworks.	PO1
2	Learn about the Error Correction and various learningalgorithmsandtasks.	PO1,PO2
3	LearthevariousPerceptionLearningAlgorithm.	PO4,PO6
4	Learnabout the various Multi-Layer Perception Network.	PO4,PO5,PO6
5	Understandthe Deep Learning of various Neural networkanditsApplications.	PO3,PO8
TextBook		
1	NeuralNetworksAClassroomApproach-SatishKumar,McGrawHill-SecondEdition.	
2.	—NeuralNetwork-AComprehensiveFoundation -SimonHaykins,PearsonPrentice Hall,2nd Edition,1999.	
ReferenceBooks		
1.	ArtificialNeuralNetworks-B.Yegnanarayana,PHI,NewDelhi1998.	
WebResources		
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	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	2	2	-	1
CO2	3	2	3	2	3	3
CO3	3	1	2	2	2	3
CO4	2	3	3	1	3	1
CO5	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	6	-	-	-	5	6	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 lit must test. Why Being Agile Works Better: Evaluating Agile benefits – How Agile approaches beat historical approaches – Why people like being Agile.									12	
II	Being Agile Agile Approaches: Diving under the umbrella of Agile approaches – Reviewing the Big Three: Lean, Scrum, Extreme Programming – Summary									12	

	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.	
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. 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 print) – Preparing the operational support – Preparing the organization for product deployment – Preparing the marketplace for product deployment	12
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 –	12

	What's	
	different about Agile communication – Managing Agile communication. Managing Quality and Risk: What's different about Agile quality – Managing Agile quality – What's different about Agile risk management – Managing Agile risk.	
V	Implementing Agile Building a Foundation: Organizational and individual commitment – Choosing the right pilot team members – Creating an environment that enables Agility – Support Agility initially and overtime. 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.	12
	Total	60
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
TextBook		
1	MarkC.Layton,StevenJ.Ostermiller,AgileProjectManagementforDummies,2ndEdition,Wiley IndiaPvt.Ltd.,2018.	
	Jeff Sutherland, Scrum – The Art of Doing Twice the Work in Half the Time, Penguin,2014.	
ReferenceBooks		
1.	MarkC.Layton,DavidMorrow, <i>ScrumforDummies</i> ,2 nd Edition,WileyIndiaPvt.Ltd.,2018.	
2.	MikeCohn,SucceedingwithAgile–SoftwareDevelopmentusingScrum,Addison-WesleySignatureSeries,2010.	
3.	AlexMoore,AgileProjectManagement,2020.	
4.	AlexMoore, <i>Scrum</i> ,2020.	
5.	Andrew Stellmanand JenniferGreene, <i>LearningAgile: UnderstandingScrum, XP,Lean,andKanban</i> ,Shroff/O'Reilly,FirstEdition,2014.	
WebResources		
1.	www.agilealliance.org/resources	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	1	2	1	2
CO2	3	1	2	1	3	1
CO3	3	2	1	1	3	1
CO4	3	2	3	2	1	3
CO5	2	3	1	2	3	2
Weightageofcourse contributedtoeach PSO	13	11	8	8	11	9

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

Subject Code	SubjectName	Category	L	T	P	S	Credits	Marks		
								CIA	Exter nal	Total
	FUNDAMENTALS OF INFORMATION TECHNOLOGY	Specif icElec ti ve	2	-	-	-	2	25	75	100
Learning Objectives										
LO1	Understandbasicconceptsandterminologyofinformationtechnology.									
LO2	Have abasicunderstandingofpersonalcomputersandtheiroperation									
LO3	Beabletoidentifydatastorageanditsusage									
LO4	Get greatknowledgeofsoftware anditsfunctionalities									
LO5	Understandaboutoperatingsystemandtheiruses									
UNIT	Contents								No.Of. Hours	
I	IntroductiontoComputers-GenerationsofComputer–DataandInformation – Components of Computer – Software – Hardware – InputDevices-OutputDevices—TypesofOperatingSystem.								6	
II	MSWord:Introduction–ElementsofWindow–Files,FoldersandDirectories – Text Manipulating: Cut, Copy, Paste, Drag and Drop – TextFormatting: Font – Style, Size, Face and Colors (Both foreground andbackground)–Alignment-BulletsandNumbering-Headerandfooter-watermark–insertingobjects(images,otherapplicationdocument)–Tablecreation – Mailmerge.								6	
III	MsExcel:Introduction–Insertingrowsandcolumns–Sizingrowsandcolumns–Implementingformulas–Generating series-Functionsinexcel –CreationofChart–Insertingobjects–Filter–Sorting–Insertingworksheet.								6	
IV	MSPowerPoint:Introduction– SlidesManipulation(Insertingnew,Copy,paste, delete and duplicate slides) – Slide show– Types of Views – TypesofAnimations–InsertingObjects–Implementingmultimedia(Videoand Audio)–Templates(Built-inandUser-Defined).								6	
V	Internet: Introductionto 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 groupmail.E-Commerce:DigitalSignature–DigitalCurrency–Onlineshoppingand transaction.								6	
TOTALHOURS								30		
CourseOutcomes								Programme Outcomes		
CO	Oncompletionofthiscourse,studentswill									

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 headers 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 an interpreter between software and hardware.	PO1, PO2, PO3, PO4, PO5, PO6
Textbooks		
1	Anoop Mathew, S. Kavitha Murugesan (2009), — Fundamental of Information Technology I, Majestic Books.	
2	Alexis Leon, Mathews Leon, I Fundamental of Information Technology I, 2 nd Edition.	
3	S. K. Bansal, — Fundamental of Information Technology I.	
Reference Books		
1.	Bhardwaj Sushil Puneet Kumar, — Fundamental of Information Technology I	
2.	GG WILKINSON, — Fundamental of Information Technology I, Wiley-Blackwell	
3.	A Ravichandran, — Fundamental of Information Technology I, 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	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	2	2	1	1
CO2	3	2	3	2	3	3
CO3	3	2	2	2	2	3
CO4	2	3	3	3	3	1
CO5	3	3	3	3	3	2

Weightage of course contributed to each PSO	13	13	13	12	12	10
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S-Strong-3 M-Medium-2 L-Low-1

Subject Code	SubjectName	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 webpage.									
LO2	Create a link within a webpage.									
LO3	Create a table within a webpage.									
LO4	Insert the heading levels within a webpage.									
LO5	Insert ordered and unordered lists within a webpage. Create a webpage.									
UNIT	Contents								No.Of. Hours	
I	Introduction: Web Basics: What is Internet – Web browsers – What is Webpage – HTML Basics: Understanding tags.								6	
II	Tags for Document structure (HTML, Head, Body Tag). Block level text elements: Headings paragraph (<p>tag) – Font style elements: (bold, italic, font, small, strong, strike, big tags)								6	
III	Lists: Types of lists: Ordered, Unordered – Nesting Lists – Other tags: Marquee, HR, BR – Using Images – Creating Hyperlinks.								6	
IV	Tables: Creating basic Table, Table elements, Caption – Table and cell alignment – Rowspan, Colspan – Cellpadding.								6	
V	Frames: Frameset – Targeted Links – No frame – Forms : Input, Textarea, Select, Option.								6	
TOTAL HOURS								30		
Course Outcomes								Programme Outcomes		
CO	On completion of this course, students will									
CO1	Knows the basic concept in HTML Concept of resources in HTML								PO1, PO2, PO3, PO4, PO5, PO6	
CO2	Knows Design concept. Concept of MetaData Understand the concept of save the files.								PO1, PO2, PO3, PO4, PO5, PO6	
CO3	Understand the page formatting. Concept of list								PO1, PO2, PO3, PO4, PO5, PO6	
CO4	Creating Links. Know the concept of creating link to email address								PO1, PO2, PO3, PO4, PO5, PO6	
CO5	Concept of adding images Understand the table creation.								PO1, PO2, PO3, PO4, PO5, PO6	
Textbooks										
1	—Mastering HTML5 and CSS3 Made Easy!, Teach U Comp Inc., 2014.									

2	ThomasMichaud, “FoundationsofWebDesign:IntroductiontoHTML&CSS”
WebResources	
1.	https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf
2.	https://www.w3schools.com/html/default.asp

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	2	3	3	3
CO3	2	3	3	3	3	3
CO4	3	3	3	3	3	3
CO5	3	3	3	2	3	3
Weightageofcourse contributedtoeachPSO	14	15	14	14	15	15

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.	Marks		
									CIA	External	Total
	WEB DESIGNING	Specific Elective	2	-	-	-	2	2	25	75	100
CourseObjective											
LO1	Understandthebasics of HTMLanditscomponents										
LO2	TostudyabouttheGraphicsinHTML										
LO3	Understandandapplytheconceptsof XMLandDHTML										
LO4	UnderstandtheconceptofJavaScript										
LO5	Toidentifyandunderstandthe goalsandobjectivesoftheAjax										
UNIT	Details						No.ofHours				
I	HTML:HTML-Introduction-tagbasics-pagestructure-addingcommentsworkingwithtexts,paragraphs and line break. Emphasizing test-headingandhorizontalrules-list-fontsize,faceandcolor-alignmentlinks-tables-frames.						6				
II	Forms&ImagesUsingHtml:Graphics:Introduction-How to work efficiently with images inwebpages,imagemaps,GIFanimation,addingmultimedia, data collection with html forms textbox,password,listbox,combobox,textarea,toolsfor buildingwebpagefrontpage.						6				
III	XML & DHTML: Cascading style sheet (CSS)-whatis CSS-Why we use CSS-adding CSS to your webpages-Groupingstyles-extensiblemarkuplanguage(XML).						6				
IV	Dynamic HTML: Document object model (DCOM)-Accessing HTML & CSS through DCOM Dynamiccontentstyles&positioning-Eventbubbling-databinding. JavaScript: Client-side scripting, What is JavaScript,HowtodevelopJavaScript,simpleJavaScript ,variables,functions,conditions,loopsandrepetition,						6				

V	Advancescript,JavaScriptandobjects,JavaScriptowno bjects,theDOMandwebbrowserenvironments,formsan dvalidations.	6
	Total	30
CourseOutcomes		ProgrammeOutcome
CO	Oncompletionofthiscourse,studentswill	
1	DevelopworkingknowledgeofHTML	PO1, PO3,PO6, PO8
2	AbilitytoDevelopandpublishWebpagesusingHypertextMa rkupLanguage(HTML).	PO1,PO2,PO3,PO6
3	AbilitytooptimizepagestylesandlayoutwithCascadingStyleS heets(CSS).	PO3,PO5
4	Abilitytodevelopajavascript	PO1,PO2,PO3, PO7
5	AnabilitytodevelopwebapplicationusingAjax.	P02,PO6,PO7
TextBook		
1	PankajSharma,—WebTechnologyl,SkKataria&SonsBangalore2011.	
2	MikeMcgrath,—JavaScriptl,DreamTechPress2006,1stEdition.	
3	AchyutSGodbole&AtulKahate,—WebTechnologiesl,2002,2ndEdition.	
ReferenceBooks		
1.	LauraLemay,RafeColburn,JenniferKyrnin,—MasteringHTML,CSS&JavascriptWeb Publishingl,2016.	
2.	DTEditorialServices(Author),—HTML5BlackBook(CoversCSS3,JavaScript,XML, XHTML,AJAX,PHP,jQuery)l,Paperback2016,2ndEdition.	
WebResources		
1.	NPTEL&MOOCcoursestitledWebDesignandDevelopment.	
2.	https://www.geeksforgeeks.org	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	-	2	1	1
CO2	3	3	-	2	-	1
CO3	3	3	-	2	2	1
CO4	3	3	-	2	-	1
CO5	3	3	3	2	-	1
Weightageofcoursec ontributed to eachPSO	15	15	3	10	3	4

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

Subject Code	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	PHPPROGRAMMING	Specific Elective	2				2	2	25	75	100
CourseObjective											
LO1	ToprovidethenecessaryknowledgeonbasicsofPHP.										
LO2	Todesignanddevelopdynamic,database-drivenwebapplicationsusingPHPversion.										
LO3	Togetanexperience onvariouswebapplicationdevelopmenttechniques.										
LO4	TolearnthenecessaryconceptsforworkingwiththefilesusingPHP.										
LO5	Togetaknowledgeon OOPSwithPHP.										
UNIT	Details									No.of Hours	
I	IntroductiontoPHP-BasicKnowledgeofwebsites-IntroductionofDynamicWebsite-IntroductiontoPHP-ScopeofPHP-XAMPP and WAMPInstallation									6	
II	PHPProgrammingBasics-SyntaxofPHP-EmbeddingPHPinHTML-EmbeddingHTMLinPHP. Introduction to PHP Variable -Understanding Data Types -UsingOperators -Using Conditional Statements -If(), else if() and else ifconditionStatement.									6	
III	Switch()Statements-Usingthewhile()Loop-Usingthefor()LoopPHPFunctions. PHPFunctions-CreatinganArray-ModifyingArrayElements-ProcessingArrayswithLoops-GroupingFormSelectionswith Arrays-UsingArrayFunctions.									6	
IV	PHPAdvancedConcepts -ReadingandWriting Files -Reading Data fromaFile.									6	
V	ManagingSessionsandUsingSessionVariables-DestroyingaSession-StoringDatainCookies-SettingCookies.									6	
	Total									30	
CourseOutcomes							ProgrammeOutcomes				
CO	Oncompletionofthiscourse,studentswill										
1	WritePHPscriptstohandleHTMLforms						PO1,PO4,PO6,PO8.				
2	Writeregularexpressionsincludingmodifiers,operators,andmetacharacters.						PO2,PO5,PO7.				
3	CreatePHP Programusingtheconceptof array.						PO3,PO6,PO8.				
4	CreatePHPprogramsthatusevariousPHP						PO2,PO3,PO5,PO8.				

	libraryfunctions	
5	Manipulate filesanddirectories.	PO3,PO5,PO6.
TextBook		
1	HeadFirstPHP&MySQL:ABrain-FriendlyGuide-2009-LynnmighleyandMichael Morrison.	
2	TheJoyofPHP:ABeginner'sGuidetoProgrammingInteractiveWebApplicationswithPHPa nd MySQL- AlanForbes	
ReferenceBooks		
1.	PHP:TheCompleteReference-StevenHolzner.	
2.	DTEditorialServices(Author),—HTML5BlackBook(CoversCSS3,JavaScript,XML, XHTML,AJAX,PHP,jQuery)¶,Paperback2016,2 nd Edition.	
WebResources		
1.	ReferMOOCCourseslikeNPTELandSWAYAM	
2.	https://www.w3schools.com/php/default.asp	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	1	1	-	1
CO2	2	-	1	1	2	1
CO3	3	3	1	1	-	1
CO4	1	3	2	1	-	1
CO5	3	2	1	1	-	1
Weightageofcoursec ontributed to eachPSO	12	11	6	5	2	5

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

Subject Code	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	SoftwareTesting	Specific Elective	2	-	-	-	2	2	25	75	100
CourseObjective											
LO1	Tostudyfundamentalconceptsinsoftwaretesting										
LO2	Todiscussvarious softwaretestingissuesandsolutionsinsoftwareunittest,integrationandsystemtesting.										
LO3	TostudythebasicconceptofDataflowtestingandDomaintesting.										
LO4	ToAcquireknowledgeonpathproductsandpathexpressions.										
LO5	TolearnaboutLogicbasedtestinganddecisiontables										
UNIT	Details						No.ofHours				
I	Introduction: Purpose–Productivity and Quality in Software–Testing Vs Debugging–Modelfor Testing–Bugs–TypesofBugs–TestingandDesignStyle.						6				
II	Flow / Graphs and Path Testing – Achievable paths – PathinstrumentationApplicationTransactionFlowTestin gTechniques.						6				
III	DataFlowTestingStrategies- DomainTesting;DomainsandPaths– DomainsandInterfaceTesting.						6				
IV	Linguistic–Metrics–StructuralMetric PathProductsandPathExpressions.SyntaxTesting– Formats–TestCases						6				
V	Logic Based Testing–Decision Tables– TransitionTesting–States,StateGraph,StateTesting.						6				
	Total						30				
CourseOutcomes							ProgramOutcomes				
CO	Oncompletionofthiscourse,studentswill										
1	Studentslearntoapplysoftwaretestingknowledgeandengineeri ngmethods						PO1				
2	Haveanabilitytoidentifytheneedsof softwaretest						PO1,PO2				

	automation, and define and develop test tools to support test automation.	
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, — Software Testing Techniques I, II Edn., Dream Tech India, New Delhi, 2003.	
2	K. V. K. Prasad, — Software Testing Tools I, Dream Tech. India, New Delhi, 2005	
Reference Books		
1.	I. Burnstein, 2003, — Practical Software Testing I, Springer International Edn.	
2.	E. Kit, 1995, — Software Testing in the Real World: Improving the Process I, Pearson Education, Delhi.	
3.	R. Rajani, and P. P. Oak, 2004, — Software Testing I, Tata Mcgraw Hill, 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	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	2	2	2	-
CO2	3	2	2	3	3	2
CO3	2	3	3	2	2	3
CO4	2	1	2	2	2	1
CO5	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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	PROBLEM SOLVING TECHNIQUES	Specific Elective	2	-	-	-	2	2	25	75	100
CourseObjective											
LO1	Understandthesystematicapproachtoproblemsolving.										
LO2	Knowthe approachandalgorithmstosolve specificfundamentalproblems.										
LO3	Understandtheefficientapproachtosolvespecificfactoring-related problems.										
LO4	Understandtheefficientarray-relatedtechniquesatosolvespecificproblems.										
LO5	Understandtheefficientmethodstosolve specificproblemsrelatedtotextprocessing. Understandhowrecursionworks.										
UNIT	Details										No.of Hours
I	Introduction: Notion of algorithms and programs – Requirements for solvingproblems by computer – The problem-solving aspect: Problem definition phase,Getting started on a problem, The use of specific examples, Similarities amongproblems,Workingbackwards from thesolution–Generalproblem-solvingstrategies-Problemsolvingusingtop-downdesign–Implementationofalgorithms–TheconceptofRecursion.										6
II	Fundamental Algorithms: Exchanging the values of two variables – Counting - Summationofasetofnumbers-Factorialcomputation-Sinefunctioncomputation - Fibonacci Series generation - Reversing the digits of an integer – BaseConversion.										6
III	Factoring Methods: Finding the square root of a number – The smallest divisorof an integer – Greatest common divisor of two integers - Generating primenumbers – Computing the prime factors of an integer – Generation of pseudo-random numbers -Raising a number to a large power– Computing the <i>n</i> thFibonaccinumber.										6
IV	Array Techniques: Array order reversal – Array counting or histograming – Finding the maximum number in a set - Removal of duplicates from an orderedarray-Partitioninganarray–Findingthe k^{th} smallestelement–Longestmonotonesubsequence.										6

V	Text Processing and Pattern Searching: Text line length adjustment – Left andright justification of text – Keyword searching in text – Text line editing – Linearpatternsearch. Recursivealgorithms: TowersofHanoi–Permutationgeneration.	6
	Total	30
CourseOutcomes		ProgrammeOutcome
CO	Oncompletionofthiscourse,studentswill	
1	Understand the logic of problem and analysesimplementationofalgorithmmandTopDownapproach andconceptof Recursion	PO1,PO6
2	Able tounderstandtheSequence ofNumbersandSeries Fibonacci,Reversing,BaseConversion.	PO2
3	AbletodoAlgebraicoperations	PO2,PO4
4	Coverageof ArraysanditsLogics	PO6,PO8
5	TextProcessingandPatternSearchingApproach	PO7
TextBook		
1	R.G.Dromey, <i>HowtoSolveitbyComputer</i> ,PearsonIndia,2007	
ReferenceBooks		
1.	George Polya, Jeremy Kilpatrick, <i>The Stanford Mathematics Problem Book: With Hints andSolutions</i> ,DoverPublications,2009(KindleEdition2013).	
2.	GregW. Scragg, <i>ProblemSolvingwithComputers</i> ,Jones&Bartlett1stedition, 1996.	
WebResources		
1.	https://www.studytonight.com/	
2.	https://www.w3schools.com/	

Mapping with Programme Outcomes:

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	OFFICE AUTOMATION	Specific Elective	2	-	-	-	2	2	25	75	100
CourseObjective											
LO1	Understandthebasicsofcomputersystemsanditscomponents.										
LO2	Understandandapplythe basicconceptsofawordprocessingpackage.										
LO3	Understandandapplythe basicconceptsofelectronicspreadsheet software.										
LO4	Understandandapplythebasicconceptsofdatabasemanagement system.										
LO5	UnderstandandcreateapresentationusingPowerPointtool.										
UNIT	Details										No. ofHours
I	Introductory concepts: Memory unit– CPU-Input Devices: Key board, MouseandScanner.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-Documentformatting– Paragraphalignment,indentation,headersandfooters,numbering ;printing–Preview,options,merge.										6
III	Spreadsheets: Excel– opening,enteringtextanddata,formatting,navigating;Formulas– entering,handlingand copying; Charts–creating, formatting andprinting,analysistables,preparationoffinancialstatements,introductiontodataanalytics.										6
IV	Database Concepts: The concept of data base management system; Datafield, records,andfiles,Sortingandindexingdata;Searchingrecords.Designingqueries,andreports;Linkingofdatafiles;UnderstandingProgramming environment in DBMS; Developing menu drive applicationsinquerylanguage(MS– Access).										6
V	Power point: Introduction to Power point - Features – Understanding slidetypecasting&viewingslides–creatingsslideshows.Applyingspecialobject – including objects & pictures – Slide transition–Animation effects,audioinclusion ,timers.										6
	Total										30
CourseOutcomes							ProgrammeOutcomes				
CO	Oncompletionofthiscourse,studentswill										
1	Possess the knowledge on the basics of computers and itscomponents						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	Peter Norton, —Introduction to Computers—Tata McGraw-Hill.	
Reference Books		
1.	Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, —Microsoft 2003—, Tata McGraw Hill.	
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	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	2	3	3	1
CO2	3	1	2	3	3	3
CO3	3	2	1	2	1	3
CO4	3	3	2	2	2	1
CO5	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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	QuantitativeAptitude	Specific Elective	2	-	-	-	2	2	25	75	100
CourseObjective											
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			
I	Numbers-HCF and LCM of numbers-Decimal fractions-Simplification-Square root and cube roots-Average-problemsonNumbers.							6			
II	ProblemsonAges-SurdsandIndices- percentage -profitsand loss - ratioandproportion-partnership-Chainrule.							6			
III	Timeandwork-pipesandcisterns-TimeandDistance - problemsontrains-Boatsandstreams-simpleinterest - compoundinterest-Logarithms-Area-Volumeandsurfacearea-racesandGamesofskill.							6			
IV	Permutation and combination-probability-TrueDiscount-BankersDiscount– Height andDistances-Oddmanout&Series.							6			
V	Calendar-Clocks-stocksand shares- Datarepresentation-Tabulation– Bar Graphs- Pie charts-Linegraphs.							6			
	Total							30			
CourseOutcomes								ProgrammeOutcome			
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 concept 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	—Quantitative Aptitude, R.S. AGGARWAL, S. Chand & Company Ltd.,	
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	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	1	2	-	2
CO2	2	2	2	3	3	1
CO3	3	2	2	2	3	3
CO4	3	2	3	2	3	3
CO5	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

SubjectCode	SubjectName	Category	L	T	P	S	Credits		Marks		
									CIA	External	Total
SKILLENHANCE MENT COURSE	Open Source Software Technologies	SkillEnha. Course	2	-	-	-	2		25	75	100
CourseObjective											
LO1	AbletoAcquireandunderstandthebasicconceptsinJava,applicationofOOPSconcepts.										
LO2	Acquireknowledgeaboutoperatorsanddecision-makingstatements.										
LO3	ToIdentifythesignificanceandapplicationofClasses,arraysandinterfacesand analyzingjavaarrays										
LO4	UnderstandabouttheapplicationsofOOPSconceptsandanalyzeoverridingand packagesthroughjavaprograms.										
LO5	CanCreatewindow-based programmingusingappletand graphicsprogramming.										
UNIT	Details									No. ofHours	
I	OpenSource–opensourcevs.commercialsoftware–WhatisLinux – FreeSoftware–WhereIcanuseLinux –Linuxkernel– Linuxdistributions.									6	
II	: Introduction Linux Essential Commands –File System concept – Standard Files –The Linux Security Model – Introduction to Unix – UnixComponentsUnixFiles–FileAttributesandPermission– StandardI/O– Redirection– PipesandFilters–GrepandStreamEditor									6	
III	Introduction - Apache Explained – Starting, Stopping and RestartingApache –Modifying the Default configuration – Securing Apache – SetuserandGroup									6	
IV	UNIT IV: MySQL: Introduction to MySQL – The show databases andtable – The USE command –Create Database and Tables – DescribeTable–Select,Insert, UpdateandDeletestatementdatabase.									6	
V	• Introduction –PHP Form processing – Database Access withPHP–MySQL,MySQLFunctions–InsertingRecords– SelectingRecords–DeletingRecords–UpdateRecords.									6	
	Total									30	
CourseOutcomes							ProgrammemeOutcomea				
CO	Oncompletionofthiscourse, studentswill										

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 application 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
TextBook		
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.	
ReferenceBooks		
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 Ridrejo, Alan Liska,—Apache Administrator's Handbook, Sams Publication.	
4.	4. Tammy Fox,—Red Hat 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.	
WebResources		
1.	Introduction to Open-Source and its benefits-Geeks for Geeks	
2.	https://www.bing.com/	

Mapping with Programme Outcomes:

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	Multimedia Systems	Specific Elective	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-Midiivs.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-RFPsandBidProposals.Designing and Producing- ContentandTalent:AcquiringContent-OwnershipofContentCreatedforProject-AcquiringTalent						6				
	Total						30				
CourseOutcomes							ProgrammeOutcomes				
CO	Oncompletionofthiscourse,studentswill										
1	understand the concepts, importance, application and theprocessof developingmultimedia						PO1				

2	to have basic knowledge and understanding about image related processings	PO1,PO2
3	To understand the framework of frames and bit image 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	Tay Vaughan, "Multimedia: Making It Work", 8th Edition, Osborne/McGraw-Hill, 2001.	
Reference Books		
1.	Ralf Steinmetz & Klara Nahrstedt "Multimedia Computing, Communication & Applications", Pearson Education, 2012.	
Web Resources		
1.	https://www.geeksforgeeks.org/multimedia-systems-with-features-or-characteristics/	

Mapping with Programme Outcomes:

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
Weightage of course contributed to each PSO	15	11	15	15	8	5

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	Advanced Excel	Specific Elective	2	-	-	-	2	2	25	75	100
CourseObjective											
LO1	Handlelargeamountsofdata										
LO2	AggregatenumERICdata andsummarizeintocategoriesandsubcategories										
LO3	Filtering,sorting,andgroupingdataorsubsetsofdata										
LO4	Createpivottablestoconsolidatedatafrommultiplefiles										
LO5	Presentingdataintheformofchartsandgraphs										
UNIT	Details						No. ofHours				
I	Basics of Excel-Customizing common options-Absoluteand relative cells-Protecting and un-protecting worksheetsandcells-Working with Functions-Writing conditionalexpressions-logicalfunctions-lookupandreferencefunctions-VlookUPwithExactMatch,ApproximateMatch-Nested VlookUP with Exact Match-VlookUP withTables,DynamicRanges-NestedVlookUPwithExactMatch-Using VLookUP to consolidate Data from MultipleSheets						6				
II	DataValidations-Specifyingavalidrangeofvalues-Specifyingalistofvalidvalues-Specifyingcustomvalidationsbasedonformula-WorkingwithTemplatesDesigningthestructureofatemplate-templatesforstandardization of worksheets - Sorting and Filtering Data -Sortingtables-multiple-levelsortings-customsortings-Filtering data for selected view -advanced filter options-Working with ReportsCreating subtotals-Multiple-levelsubtotal.						6				
III	CreatingPivottables FormattingandcustomizingPivot tables- advancedoptionsofPivottables- Pivotcharts-						6				

	Consolidating data from multiple sheets and files using Pivot table s-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.	
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
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
	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

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	2	1	3	-
CO2	3	2	2	1	1	3
CO3	3	2	1	2	1	3
CO4	3	3	2	2	2	1
CO5	3	2	1	3	1	3
Weightageofcourse contributedtoeach PSO	14	11	8	9	8	10

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	Biometrics	Specific Elective	2	-	-	-	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			
I	Introduction: What is Biometrics, History, Types of biometric Traits, General architecture of biometrics systems, Basic working of biometric matching, Biometrics 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			
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			

III	Privacy Enhancement Using Biometrics: Introduction, Privacy Concerns Associated with Biometric Deployments, Identity and Privacy, Privacy Concerns, Biometrics with Privacy Enhancement, Comparison of Various Biometrics in Terms of Privacy, Soft Biometrics. 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.	6
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
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
	Total	30
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	PO1, PO2, PO3, PO6

	andFingerprintBiometrics.	
CO3	ToanalysethePrivacyEnhancementandMultimodalBiometri cs.	PO3,PO5
CO4	Togetanalyticalidea onWatrmarkingTechniques	PO1,PO2,PO3, PO7
CO5	ToGainknowledgeonFuturescopeofBiometrics,and StudyofvariousBiometricTechniques.	PO2,PO6,PO7
RecommendedText		
1.	Biometrics: ConceptsandApplicationsbyG.R Sinha andSandeepB.Patil,Wiley,2013	
ReferencesBooks		
1.	Guide to Biometrics by Ruud M. Bolle , SharathPankanti, Nalinik.Ratha, AndrewW.Senior,JonathanH.Connell, Springer2009	
2.	IntroductiontoBiometricsbyAnilk.Jain,ArunA.Ross,KarthikNandakumar	
3.	HandbookofBiometricsbyAnilK. Jain,PatrickFlynn, ArunA.Ross.	
WebResources		
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	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	3	2	2	1	1
CO2	3	1	3	2	3	3
CO3	3	2	1	-	2	3
CO4	3	-	3	3	3	1
CO5	3	3	3	3	1	2
Weightageofcourse contributedtoeach PSO	13	9	12	10	10	10

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	Cyber Forensics	Specific Elective	2	-	-	-	2	2	25	75	100
CourseObjective											
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				
I	Overview of Computer Forensics Technology: Computer Forensics Fundamentals: What is Computer Forensics Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of professional Forensics Methodology, Steps taken by Computer Forensics Specialists. Types of Computer Forensics Technology: Types of Business Computer Forensic Technology – Types of Military Computer Forensic Technology – Types of Law Enforcement – Computer Forensic Technology – Types of Business Computer Forensic Technology.						6				
II	Computer Forensics Evidence and capture: Data Recovery: Data Recovery Defined, Data Back-up and Recovery, The Role of Back-up in Data Recovery, The Data – Recovery Solution. Evidence Collection and Data Seizure: Collection Options, Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence, General Procedure, Collection and Archiving, Methods of Collections, Artefacts, Collection Steps, Controlling Contamination: The chain of custody.						6				

III	Duplication and Preservation of Digital Evidence: Processing steps, Legal Aspects of collecting and Preserving Computer forensic Evidence. Computer image Verification and Authentication: Special needs of Evidence Authentication, Practical Consideration, Practical Implementation.	6
IV	Computer Forensics Analysis: Discovery of Electronic Evidence: Electronic Document Discovery: A Powerful New Litigation Tool. Identification of Data: Time Travel, Forensic Identification and Analysis of Technical Surveillance Devices.	6
V	Reconstructing Past Events: How to Become a Digital Detective, Useable File Formats, Unusable File Formats, Converting Files. Networks: Network Forensics Scenario, a technical approach, Destruction Of E-Mail, Damaging Computer Evidence, Documenting The Intrusion on Destruction of Data, System Testing.	6
	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 forensic technology.	PO1, PO2
3	Analyze various computer forensic 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,PhillipsEnfinger,Steuart,—ComputerForensicsandInvestigations¶Enfinger,Steuart, CENGAGE Learning,2004.
2.	AnthonySammesandBrianJenkinson,¶ForensicComputing:APractitioner'sGuide¶,SecondEd ition, Springer–VerlagLondonLimited,2007.
3.	.RobertM.Slade,¶SoftwareForensicsCollecting EvidencefromtheSceneofaDigitalCrime¶,TMH2005.
WebResources	
1.	https://www.vskills.in
2.	https://www.hackingarticles.in/best-of-computer-forensics-tutorials/

MappingwithProgrammeOutcomes:

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

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	Pattern Recognition	Specific Elective	2	-	-	-	2	2	75	25	100
CourseObjective											
LO1	Tolearnthefundamentals of PatternRecognitiontechniques										
LO2	TolearnthevariousStatisticalPatternrecognitiontechniques										
LO3	Tolearnthelineardiscriminantfunctionsandunsupervisedlearningandclustering										
LO4	TolearnthevariousSyntacticalPatternrecognitiontechniques										
LO5	TolearntheNeuralPatternrecognitiontechniques										
UNIT	Details						No.of Hours				
I	PATTERNRECOGNITIONOVERVIEW:Pattern recognition, Classification and Description-Patterns andfeatureExtractionwithExamples-TrainingandLearningin PR systems-PatternrecognitionApproaches						6				
II	STATISTICALPATTERNRECOGNITION: Introduction to statistical Pattern Recognition-supervisedLearningusingParametricandNon-ParametricApproaches.						6				
III	LINEAR DISCRIMINANT FUNCTIONS ANDUNSUPERVISEDLEARNINGANDCLUSTERI NG: Introduction-Discrete and binary Classification Problems- Techniques to directly Obtain linear Classifiers - FormulationofUnsupervisedLearningProblems-Clustering forunsupervisedlearningandclassification						6				
IV	SYNTACTICPATTERNRECOGNITION:Overviewof Syntactic Pattern Recognition-Syntactic recognition viaparsing and other grammars–Graphical Approaches tosyntacticpatternrecognition-Learningvia grammatical inference.						6				
V	NEURAL PATTERN RECOGNITION: Introduction toNeural Networks-Feed-forward Networks and training byBackPropagation-Content AddressableMemoryApproaches andUnsupervisedLearninginNeuralPR						6				
	Total						30				
CourseOutcomes							ProgrammeOutcomes				
CO	Oncompletionofthiscourse,studentswill										
1	understandtheconcepts,importance,applicationandthe processof developingPatternrecognitionoverview						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 image 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	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	3	1	2	-	2
CO2	2	2	2	3	3	1
CO3	3	2	-	3	2	3
CO4	3	3	3	2	3	3
CO5	2	3	1	2	3	2
Weightage of course credit contributed to each PSO	12	13	7	12	11	11

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	ERP	Specific Elective	2	-	-	-	2	2	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 softwares such as enterprise resource planning and customer relationship management										
LO4	To train the students to develop the basic understanding of how ERP enriches the business organizations in achieving a multidimensional growth										
LO5	To aim at preparing the students technological competitive and make them ready to self-upgrade with the high technical skills										
UNIT	Details							No. of Hours			
I	ERP Introduction, Benefits, Origin, Evolution and Structure: Conceptual Model of ERP, the Evolution of ERP, the Structure of ERP, Components and needs of ERP, ERP Vendors; Benefits & Limitations of ERP Packages.							6			
II	Need to focus on Enterprise Integration/ERP; Information mapping; Role of common shared Enterprise database; System Integration, Logical vs. Physical System Integration, Benefits & limitations of System Integration, ERP's Role in Logical and Physical Integration. Business Process Reengineering, Data Warehousing, Data Mining, Online Analytic Processing (OLAP), Product Life Cycle Management (PLM), LAP, Supply chain Management.							6			
III	ERP Marketplace and Marketplace Dynamics: Market Overview, Marketplace Dynamics, the Changing ERP Market. ERP-Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications. Cloud and Open Source, Quality Management, Material Management, Financial Module, CRM and Case Study.							6			
IV	ERP Implementation Basics, ERP Implementation Strategy, ERP Implementation Life Cycle, Pre-Implementation task, Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees.							6			

V	ERP&E-Commerce,FutureDirectives-inERP,ERPand	6
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	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	Understandandapplytheconceptsof ERP Manufacturing PerspectiveandERP Modules	PO1,PO3,PO7
CO4	Discusshebenefitsof 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	-
Weightageofcoursecon-tributedtoeach PSO	10	11	6	7	11	6

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	RoboticsandIts Applications	Specific Elective	2	-	-	-	2	2	25	75	100
CourseObjective											
LO1	Tounderstandtheroboticsfundamentals										
LO2	Understandthesensorsandmatrixmethods										
LO3	UnderstandtheLocalization:Self-localizationsandmapping										
LO4	TostudyabouttheconceptofPathPlanning,Visionsystem										
LO5	Tolearnabouttheconceptofrobotartificialintelligence										
UNIT	Details							No.of Hours			
I	Introduction:Introduction,briefhistory,componentsofrobotics, classification, workspace, work-envelop, motion ofrobotic arm, end-effectors and its types, service robot and itsapplication,ArtificialIntelligenceinRobotics.							6			
II	Actuatorsandsensors:Typesofactuators,stepper-DC-servo-andbrushless motors-modelof a DC servo motor-typesoftransmissions-purposeofsensor-internalandexternal sensor-common sensors-encoders tachometers-straingaugebasedforcetorque-sensor-proximityanddistancemeasuringsensors Kinematics of robots: Representation of joints and frames,frametransformation,homogeneousmatrix,D-Hmatrix,Forward and inverse kinematics: two link planar (RR) andspherical robot (RRP). Mobile robot Kinematics: Differentialwheelmobilerobot							6			
III	Localization: Self-localizations and mapping - Challenges inlocalizations–IRbasedlocalizations–visionbasedlocalizations–Ultrasonicbasedlocalizations-GPSlocalizationsystems.							6			
IV	PathPlanning:Introduction,pathplanning-overview-road map path planning-cell decomposition path planning							6			

	potential fieldpathplanning-obstacleavoidance-case studies Vision system: Roboticvisionsystems- imagerepresentation-objectrecognition-andcategorization- depthmeasurement-imagedatacompression-visualinspection- softwareconsiderations	
V	Application:Arielrobots- collisionavoidancerobotsforagriculture-mining-exploration- underwater-civilian-andmilitary applications- nuclear applications-spaceApplications- Industrialrobots-artificialintelligenceinrobots-application of robots in material handling-continuousarc welding-spot welding-spray painting-assembly operation-cleaning-etc.	6
	Total	30
CourseOutcomes		ProgrammeOutcomes
CO	Oncompletionofthiscourse,studentswill	
1	Describethedifferentphysicalformsofroto architectures.	PO1
2	Kinematicallymodelsimplemanipulatorand mobile robots.	PO1,PO2
3	Mathematicallydescribeakinematicrobotssystem	PO4,PO6
4	Analyzemanipulationand navigationproblemsusingknowledgeofcoordinateframes,kin ematics, optimization,control,anduncertainty.	PO4,PO5,PO6
5	Programroboticsalgorithmsrelatedtokinematics, control,optimization,anduncertainty.	PO3,PO8
TextBook		
1	RicharedD.Klafter.ThomasAchmielewskiandMickaelNegin,RoboticEngineeringandIntegratedA pproach,PrenticeHallIndia-Newdelhi-2001	
2	SaeedB.Nikku,Introductiontorobotics,analysis,controland applications,Wiley-India,2 nd edition2011	
ReferenceBooks		
1.	Industrial robotic technology-programming and application by M.P.Groover et.al, McGrawhill2008	
2.	RoboticstechnologyandflexibleautomationbyS.R.Deb,THH-2009	
WebResources		
1.	https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_robotics.htm	
2.	https://www.geeksforgeeks.org/robotics-introduction/	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	2	1	3	-
CO2	2	2	2	3	1	3
CO3	3	2	3	2	1	3
CO4	3	3	2	2	2	1
CO5	3	2	1	3	3	3
Weightageofcoursec ontributed to eachPSO	13	11	10	11	10	10

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	SimulationandModeling	Specific Elective	2	-	-	-	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				
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				

II	RandomVariateGeneration–RandomNumbers– RandomNumberGenerators–Generalprinciples– InverseTransformMethod–AcceptanceRejectionMethod– CompositionMethod–RelocateandRescaleMethod - Specific distributions-Output Data Analysis – Introduction-TypesofSimulationWithRespecttoOutput Analysis - Stochastic Process and Sample Path - SamplingandSystematicErrors-Mean,StandardDeviation and Confidence Interval - Analysis of Finite-Horizon Simulations - Single Run - Independent Replications-SequentialEstimation–Analysisof	6
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	Steady-State Simulations-Removal of Initialization Bias (Warm-up Interval)-Replication-Deletion Approach-Batch-Means Method.	
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
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)-SISOR PRFOM Behavior Modeling-General AI Algorithms-Decision Trees-Neural Networks - Finite State Machines - Logic Programming - Production Systems-Path Planning-Off-Line Path Planning - Incremental Path Planning - Real-Time Path Planning-Script Programming-Script Parsing-Script Execution.	6
V	Optimization Algorithms-Genetic Algorithms-Simulated Annealing Examples: Sensor Systems Modeling-Human Eye Modeling-Optical Sensor Modeling-Radar Modeling.	6
	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
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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.	
Reference Books		
1.	Andrew F. Seila, Vlatko Cerić, 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	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	2	-	1
CO2	3	1	3	2	3	3
CO3	3	2	-	-	2	3
CO4	3	-	3	3	3	1
CO5	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

SubjectCode	SubjectName	Category	L	T	P	O	Credits	Inst.Hours	Marks		
									CIA	External	Total
	OrganizationalBehaviour	Specific Elective	2	-	-	-	2	2	25	75	100
Learning Objectives											
LO1	TohaveextensiveknowledgeonOBandthescopeofOB.										
LO2	TocreateawarenessofIndividualBenaviour.										
LO3	ToenhancetheunderstandingofGroupBehaviour										
LO4	ToknowthebasicsofOrganisaitonalCultureandOrganisationalStructure										
LO5	TounderstandOrganisationalChange,ConflictandPower										
UNIT	Details							No. ofHours			
I	INTRODUCTION: ConceptofOrganizationalBehavior(OB):Nature,ScopeandRoleofOB:Disciplinesthatcontribute to OB; Opportunities for OB (Globalization, Indianworkforce diversity, customer service, innovation and change,networkedorganizations,work-lifebalance,peopleskills, positiveworkenvironment,ethics)							6			
II	INDIVIDUALBEHAVIOUR: 1. Learning, attitude and Job satisfaction: Concept of learning,conditioning, shaping and reinforcement. Concept of attitude,components, behavior and attitude. Job satisfaction: causation;impactof satisfiedemployeesonworkplace. 2. Motivation : Concept; Theories (Hierarchy of needs, X andY, Two factor, McClelland, Goal setting, Self-efficacy, Equitytheory);Jobcharacteristicsmodel;Redesigningjobs, 3. Personality andValues : Conceptof personality; Myers-Briggs Type Indicator (MBTI); Big Five model. Relevance ofvalues;Linkingpersonalityandvaluestotheworkplace(person-jobfit,person-organizationfit) 4. Perception,DecisionMaking:PerceptionandJudgements; Factors;Linkingperceptiontoindividualdecisionmaking:							6			
III	GROUPBEHAVIOUR: 1.GroupsandWorkTeams:Concept:Fiv eStagemodelofgroupdevelopment;Groupnorms, cohesiveness ; Group think and shift ; Teams; types ofteams; Creating team players from individuals and team basedwork(TBW) 2. Leadership : Concept; Trait theories; Behavioraltheories(OhioandMichiganstudies);Contingency							6			

	theories(Fiedler,HerseyandBlanchard,Path-Goal);	
IV	ORGANISATIONALCULTURE AND STRUCTURE : Concept of culture; Impact (functions and liability); Creatingandsustainingculture:Conceptofstructure,Prevalentorg anizationaldesigns:Newdesignoptions	6
V	ORGANISATIONALCHANGE,CONFLICTANDPOWER: Forcesofchange;Plannedchange;Resistance;Approaches(Lewin's model,Organisationaldevelopment);,Conceptofconflict,Conflictp rocess;Types,Functional/Dysfunctional. Introductiontopowerandpolitics.	6
		30
Course Outcomes	OnCompletionofthecoursethestudentswill	ProgramOutcomes
CO1	To define OrganisationalBehaviour, Understand the opportunitythroughOB.	PO1,PO2,PO6, PO7
CO2	Toapplyself-awareness,motivation,leadershipandlearning theoriesatworkplace.	PO2,PO4. PO5,PO6
CO3	Toanalyzethecomplexitiesandsolutionsofgroupbehaviour.	PO1, PO2,PO4, PO5, PO6
CO4	Toimpactandbringpositivechangeinthecultureofthe organisaition.	PO2,PO3,PO4PO5, PO8
CO5	Tocreateacongenialclimateintheorganization.	PO1,PO2,PO5PO6, PO8
ReadingList		
1.	NeharikaVohraStephenP.Robbins,TimothyA.Judge, <i>OrganizationalBehaviour</i> , PearsonEducation,18 th Edition,2022.	
2.	FredLuthans, <i>OrganizationalBehaviour</i> ,TataMcGrawHill,2017.	
3.	RayFrench,CharlotteRayner,GaryRees&SallyRumbles, <i>OrganizationalBehaviour</i> , JohnWiley&Sons,2011	
4.	LouisBevoc,AllisonShearsett,RachaelCollinson, <i>OrganizationalBehaviourReference</i> , NutriNicheSystemLLC(28April2017)	
5.	Dr.ChristopherP.Neck,JefferyD.Houghton andEmmaL.Murray, <i>Organizational Behaviour:ASkill-BuildingApproach</i> ,SAGE Publications,Inc;2ndedition(29November2018).	
ReferencesBooks		
1.	UmaSekaran,OrganizationalBehaviourText&cases,2 nd edition,TataMcGrawHill PublishingCO. Ltd	
2.	GangadharRao,Narayana, V.S.PRao,OrganizationalBehaviour1987,Reprint2000, KonarkPublishersPvt.Ltd, 1 st edition	
3.	S.S.Khanka,OrganizationalBehaviour,S.Chand&Co,NewDelhi.	
4.	J. Jayasankar,OrganizationalBehaviour,MarghamPublications, Chennai,2017.	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	2	2	1	3	1
CO2	3	2	2	3	1	3
CO3	3	2	3	1	1	3
CO4	3	3	2	2	2	1
CO5	3	2	1	3	3	3
Weightageofcoursec ontributedtoeach PSO	13	11	10	10	10	11

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

Subject Code	SubjectName	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	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	Internet as a source of infotainment									
LO5	Study of internet audiences and about cybercrime									
UNIT	Contents								No. Of. Hours	
I	The emergence of internet as a mass medium – the world of ‘worldwide web’.								6	
II	Features of internet as a technology.								6	
III	Internet as a source of infotainment – classification based on content and style.								6	
IV	Demographic and psychographic descriptions of internet ‘audiences’ – effect of internet on the values and life-styles.								6	
V	Present issues such as cybercrime and future possibilities.								6	
TOTAL HOURS								30		
Course Outcomes								Programme Outcomes		
CO	On completion of this course, students will									
CO1	Knows the basic concept in internet Concept of mass medium and worldwide web								PO1, PO2, PO3, PO4, PO5, PO6	
CO2	Knows the concept of internet as a technology.								PO1, PO2, PO3, PO4, PO5, PO6	
CO3	Understand the concept of infotainment and classification based on content and style								PO1, PO2, PO3, PO4, PO5, PO6	
CO4	Can be able to know about Demographic and psychographic description of internet								PO1, PO2, PO3, PO4, PO5, PO6	
CO5	Understand the concept of cybercrime 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, KM [1992] Media Issues. Sterling Publishers Pvt Ltd.									
	Reference Book									

1	Acharya,RN[1987]TelevisioninIndia.ManasPublications,NewDelhi.
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MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	2	3	3	3
CO3	2	3	3	3	3	3
CO4	3	3	3	3	3	3
CO5	3	3	3	2	3	3
Weightage of coursecontributedtoeach PSO	14	15	14	14	15	15

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