Placed at the meeting of
Academic Council
held on 15.11.2023

APPENDIX - BH

MADURAI KAMARAJ UNIVERSITY

(University with Potential for Excellence)

Bachelor of Computer Applications (B.C.A)

Revised Syllabus

(CBCS–Semester Pattern)

(With effect from the Academic Year 2023 onwards)

STRUCTURE OF THE SYLLABUS

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 elsewhere within and outside India. Quality education in general and higher education in particular deserves high priority to enable the young and future generation of students to acquire skill, training and knowledge in order to enhance their thinking, creativity, comprehension and application abilities and prepare them to compete, succeed and excel globally. Learning Outcomes-based Curriculum Framework (LOCF) which makes it student-centric, interactive and outcome-oriented with well-defined aims, objectives and goals to achieve. LOCF also aims at ensuring uniform education standard and content delivery across the state which will help the students to ensure similar quality of education irrespective of the institute and location.

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

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

Programme Outcome, Programme Specific 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.

LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK GUIDELINES BASED REGULATIONS FOR UNDER GRADUATE PROGRAMME	
Programme:	**B.C.A.,**
Programme Code:	
Duration:	**3 years [UG]**

Programme Outcomes:	**PO1: Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study **PO2: Communication Skills:** Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups. **PO3: Critical thinking:** Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development. **PO4: Problem solving: Capacity** to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations. **PO5: Analytical reasoning**: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints. **PO6: Research-related skills**: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation **PO7: Cooperation/Team work:** Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team **PO8: Scientific reasoning**: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective. **PO9: Reflective thinking**: Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society. **PO10 Information/digital literacy:** Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data. **PO 11 Self-directed learning**: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion. **PO 12 Multicultural competence:** Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups. **PO 13: Moral and ethical awareness/reasoning**: Ability to embrace

	moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demon starting the ability to identify ethical issues related to one" s work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work. **PO 14: Leadership readiness/qualities:** Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way. **PO 15: Lifelong learning:** Ability to acquire knowledge and skills, including „learning how to learn" , that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.
Programme Specific Outcomes:	**PSO1**: To enable students to apply basic microeconomic, macroeconomic and monetary concepts and theories in real life and decision making. **PSO 2**: To sensitize students to various economic issues related to Development, Growth, International Economics, Sustainable Development and Environment. **PSO 3**: To familiarize students to the concepts and theories related to Finance, Investments and Modern Marketing. **PSO 4**: Evaluate various social and economic problems in the society and develop answer to the problems as global citizens. **PSO 5:** Enhance skills of analytical and critical thinking to analyze effectiveness of economic policies.

	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
PSO 1	Y	Y	Y	Y	Y	Y	Y	Y
PSO 2	Y	Y	Y	Y	Y	Y	Y	Y
PSO3	Y	Y	Y	Y	Y	Y	Y	Y
PSO 4	Y	Y	Y	Y	Y	Y	Y	Y
PSO 5	Y	Y	Y	Y	Y	Y	Y	Y

3 – Strong, 2- Medium, 1- Low

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 Mathematics based problem solving skills are included as mandatory components in the 'Training for Competitive Examinations' course at the final semester, a first of its kind.
- The curriculum is designed so as to strengthen the Industry-Academia interface and provide more job opportunities for the students.
- The Industrial Statistics course is newly introduced in the fourth semester, to expose the students to real life problems and train the students on designing a mathematical model to provide solutions to the industrial problems.
- The Internship during the second year vacation will help the students gain valuable work experience, that connects classroom knowledge to real world experience and to narrow down and focus on the career path.
- Project with viva-voce component in the fifth semester enables the student, application of conceptual knowledge to practical situations. The state of art technologies in conducting a Explain in a scientific and systematic way and arriving at a precise solution is ensured. Such innovative provisions of the industrial training, project and internships will give students an edge over the counterparts in the job market.
- State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature are incorporated as Elective courses, covering conventional topics to the latest - Artificial Intelligence.

ValueadditionsintheRevampedCurriculum:

Semester	NewlyintroducedComponents	Outcome/ Benefits
I	**FoundationCourse** To ease the transition of learningfrom higher secondary to highereducation,providinganoverviewofthepedagogyoflearningLiteratureandanalysingtheworldthroughtheliterarylens givesrisetoanewperspective.	➢ Instill confidenceamongstudents ➢ Createinterestforthesubject
I,II,III,IV	**SkillEnhancementpapers**(Discipline centric /Generic/Entrepreneurial)	➢ Industry readygraduates ➢ Skilledhumanresource ➢ Studentsareequippedwithessentialskillsto makethememployable
		➢ Trainingonlanguageand communicationskillsenablethestudents gain knowledge and exposureinthecompetitiveworld.
		➢ Discipline centric skillwillimprovetheTechnical knowhow ofsolvingreallife problems.

III,IV,V& VI	Electivepapers	➢ Strengthening thedomainknowledge ➢ Introducing thestakeholdersto theState-of Arttechniquesfrom the streamsofmulti-disciplinary,crossdisciplinaryandinterdisciplinarynature ➢ Emerging topics inhigher education/industry/communicationnetwork/healthsectoretc.areintroducedwith hands-on-training.

IV	ElectivePapers	➢ Exposuretoindustrymouldsstudentsintosolutionproviders ➢ GeneratesIndustryready graduates ➢ Employmentopportunitiesenhanced
VSemester	Electivepapers	➢ Self-learning isenhanced ➢ Applicationoftheconcepttorealsituationisconceivedresulting intangibleoutcome
VISemester	Electivepapers	➢ Enriches the studybeyondthe course. ➢ Developingaresearchframework and presenting their independent and intellectual ideas effectively.
ExtraCredits: ForAdvancedLearners/Honorsdegree		➢ Tocatertotheneedsofpeerlearners/research aspirants
SkillsacquiredfromtheCourses	Knowledge, Problem Solving, Analytical ability,ProfessionalCompetency,ProfessionalCommunicationandTransferrable Skill	

Credit Distribution for UG Programmes

Sem I	Credit	H	Sem II	Credit	H	Sem III	Credit	H	Sem IV	Credit	H	Sem V	Credit	H	Sem VI	Credit	H
Part 1. Language – Tamil	3	6	Part..1. Language – Tamil	3	6	Part..1. Language – Tamil	3	6	Part..1. Language – Tamil	3	6	5.1 Core Course – \CC IX	4	5	6.1 Core Course – CC XIII	4	6
Part.2 English	3	6	Part..2 English	3	6	Part..2 English	3	6	Part..2 English	3	6	5.2 Core Course – CC X	4	5	6.2 Core Course – CC XIV	4	6
1.3 Core Course – CC I	5	5	2..3 Core Course – CC III	5	5	3.3 Core Course – CC V	5	5	4.3 Core Course – CC VII Core Industry Module	5	5	5. 3.Core Course CC -XI	4	5	6.3 Core Course – CC XV	4	6
1.4 Core Course – CC II	5	5	2.4 Core Course – CC IV	5	5	3.4 Core Course – CC VI	5	5	4.4 Core Course – CC VIII	5	5	5. 4.Core Course –/ Project with viva-voce CC -XII	4	5	6.4 Elective -VII Generic/ Discipline Specific	3	5
1.5 Elective I Generic/ Discipline Specific	3	4	2.5 Elective II Generic/ Discipline Specific	3	4	3.5 Elective III Generic/ Discipline Specific	3	4	4.5 Elective IV Generic/ Discipline Specific	3	3	5.5 Elective V Generic/ Discipline Specific	3	4	6.5 Elective VIII Generic/ Discipline Specific	3	5
1.6 Skill Enhancement Course SEC-1	2	2	2.6 Skill Enhancement Course SEC-2	2	2	3.6 Skill Enhancement Course SEC-4, (Entrepreneurial Skill)	1	1	4.6 Skill Enhancement Course SEC-6	2	2	5.6 Elective VI Generic/ Discipline Specific	3	4	6.6 Extension Activity	1	-
1.7 Skill Enhancement -(Foundation Course)	2	2	2.7 Skill Enhancement Course –SEC-3	2	2	3.7 Skill Enhancement Course SEC-5	2	2	4.7 Skill Enhancement Course SEC-7	2	2	5.7 Value Education	2	2	6.7 Professional Competency Skill	2	2
						3.8 E.V.S.	-	1	4.8 E.V.S	2	1	5.8 Summer Internship /Industrial Training	2				
	23	**30**		**23**	**30**		**22**	**30**		**25**	**30**		**26**	**30**		**21**	**30**
Total – 140 Credits																	

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
		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
		23	**30**

Second Year – Semester-III

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-4 (Entrepreneurial Based)	1	1
	Skill Enhancement Course -SEC-5 (Discipline / Subject Specific)	2	2
	E.V.S	-	1
		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
		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
		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
		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	List of Courses	Credit	Hours per week (L/T/P)
Part-I	Language	3	6
Part-II	English	3	6
Part-III	CC1–Python Programming	5	5
	CC2-Practical:Python Programming Lab	5	5
	ElectiveCourse1(Generic/Discipline Specific)–EC1 Digital Logic Fundamentals	3	4
	SkillEnhancementCourse-SEC-1(NME)-Office Automation Lab	2	2
Part-IV	Foundation Course FC–Structured programming in C	2	2
		23	**30**

Semester-II

Part	List of Courses	Credit	Hours per Week (L/T/P)
Part-I	Language	3	6
Part-II	English	3	6
Part-III	CC3–Object Oriented Programming Concepts using C++	5	5
	CC4 -Practical: C++Programming Lab	5	5
	Elective Course 2(Generic/Discipline Specific)–EC2 Financial Accounting	3	4
Part-IV	Skill Enhancement Course-SEC-2-**(**NME)- Introduction to HTML	2	2
	Skill Enhancement Course–SEC-3(Discipline/Subject Specific)– Multimedia Systems	2	2
		23	**30**

Second Year

Semester-III

Part	List of Courses	Credit	Hours per Week (L/T/P)
Part-I	Language	3	6
Part-II	English	3	6
Part-III	CC5-Data Structures and Algorithms	5	5
	CC6-Practical:Data Structures and Algorithms Lab	5	5
	Elective Course 3(Generic/Discipline Specific)-EC3-Numerical Methods	3	4
Part-IV	Skill Enhancement Course-SEC-4(Entrepreneurial Based)–Understanding Internet Lab	1	1
	Skill Enhancement Course-SEC-5(Discipline Specific/Generic) Biometrics	2	2
	Environmental Studies	-	1
		22	**30**

Semester-IV

Part	List of Courses	Credit	Hours per week (L/T/P)
Part-I	Language	3	6
Part-II	English	3	6
Part-III	CC7-ProgramminginJava	5	5
	CC8 -Practical: Programming in Java Lab	5	5
	Elective Course-EC4(Generic/Discipline Specific)–Resource Management Techniques	3	3
Part-IV	Skill Enhancement Course–SEC-6- PHP Programming Lab	2	2
	Skill Enhancement Course-SEC-7 –Advanced Excel	2	2
	Environmental Studies	2	1
		25	**30**

Third year

Semester-V

Part	List of Courses	Credit	Hours per Week (L/T/P)
Part-III	CC9–Operating System	4	5
	CC10-ASP.Net Programming	4	5
	CC11-Practical:ASP.Net Programming Lab	4	5
	Elective Course–EC5 (Discipline Specific)– Software Project Management	3	4
	ElectiveCourse–EC6(Discipline Specific)– Database Management System	3	4
	CC12-Project with Viva voce(Individual)	4	5
Part-IV	Value Education	2	2
	Internship/Industrial Training (Summer vacation at the end of IV semester activity)	2	
		26	**30**

Semester-VI

Part	List of Courses	Credit	Hours per week (L/T/P)
Part-III	CC13-Computer Networks	4	6
	CC14–DataAnalytics using R Programming	4	6
	CC15- Practical: R Programming Lab	4	6
	Elective Course–EC7(Discipline Specific)– Cloud Computing	3	5
	Elective Course–EC8(Discipline Specific)– IOT and its Applications Lab	3	5
Part-IV	Professional Competency Skill Enhancement Course-SEC8 Software Testing	2	2
Part-V	Extension Activity	1	--
		21	**30**

Total Credits: 140

CORE PAPER
FIRST YEAR

SEMESTER - I

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
CC1	PYTHON PROGRAMMING		5	-	-	-	5	25	75	100

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

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

V	**Python File Handling:** Types of files in Python - Opening and Closing files-Reading and Writing files: write() and writelines() methods- append() method – read() and readlines() methods – with keyword – Splitting words – File methods - File Positions- Renaming and deleting files.	**15**
	TOTAL HOURS	**75**

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

Textbooks

1	Reema Thareja, "Python Programming using problem solving approach", First Edition, 2017, Oxford University Press.
2	Dr. R. Nageswara Rao, "Core Python Programming", First Edition, 2017, Dream tech Publishers.

Reference Books

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

Web Resources

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

Mapping with Programme Outcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
CC2	PYTHON PROGRAMMING LAB		-	-	5	-	5	40	60	100

ourse Objectives:

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

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

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

Mapping with Programme Outcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
EC1	DIGITAL LOGIC FUNDAMENTALS		4	-	-	-	3	25	75	100

Learning Objectives	
LO1	Classify various gates, binary codes and illustrate laws and theorem's of Boolean Algebra
LO2	Convert numbers from one radix to another and build logic circuits with optimal design
LO3	Apply binary addition, subtraction 2's complement arithmetic to implement arithmetic circuits
LO4	Assess the functioning of multiplexer, decoder, flip flop, register and memory
LO5	Design a digital circuit using the knowledge acquired from combinational logic, sequential logic, and K-map

UNIT	Contents	No. of Hours
I	Number Systems and Codes: Number System–Base Conversion – Binary Codes – Code Conversion. Digital Logic: Logic Gates – Truth Tables – Universal Gates.	12
II	Boolean Algebra: Laws and Theorems – SOP, POS Methods – Simplification of Boolean Functions – Using Theorems, K-Map, Prime – Implicant Method – Binary Arithmetic: Binary Addition – Subtraction – Various Representations of Binary Numbers–Arithmetic Building Blocks–Adder–Subtractor.	12
III	Combinational Logic: Logic: Multiplexers -16 to 1 Multiplexer-nibble multiplexer Demultiplexers – 1 to 16 Demultiplexer Decoders – 1 of 16 Decoder- BCD- to Decimal Decoder- Encoders- Decimal to BCD encoders –Parity Generators and Checkers.	12
IV	Sequential Logic: RS, JK, D, and T Flip-Flops–Master-Slave Flip Flops. Registers: Shift Registers -Types of Shift Registers.	12
V	Counters: Asynchronous and Synchronous Counters - Ripple, Mod, Up-Down Counters– Ring Counters. Memory: Basic Terms and Ideas –Types of ROMs –Types of RAMs.	12
	TOTAL HOURS	**60**

Textbooks

1 Donald P Leach, Albert Paul Malvino & Goutam Saha (2015), "Digital Principles and Applications", McGraw Hill Education (India) Private Limited, New Delhi, Eighth Edition, Third reprint.

Reference Books

1.	V.Rajaraman and T.Radhakrishnan (2008), An Introduction to Digital Computer Design, Fourth Edition, Prentice Hall of India
2.	M.Morris Mano (2019), Digital Logic and Computer Design, Second Edition, Prentice Hall of India.
Web Resources	
1.	https://www.tutorialspoint.com/digital_circuits/digital_circuits_logic_gates.html
2.	https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/

Mapping with Programme Outcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
SEC-1(NME)	**OFFICE AUTOMATION**	Specific Elective		Y	-	-	2	2	25	75	100
Course Objective											
LO1	Understand the basics of computer systems and its components.										
LO2	Understand and apply the basic concepts of a word processing package.										
LO3	Understand and apply the basic concepts of electronic spreadsheet software.										
LO4	Understand and apply the basic concepts of database management system.										
LO5	Understand and create a presentation using PowerPoint tool.										
UNIT	**Details**										**No. of Hours**
I	**Introductory concepts:**										6

	Memory unit– CPU-Input Devices: Key board, Mouse and Scanner. Outputdevices:Monitor,Printer.IntroductiontoOperatingsystems&itsfeatures:DOS–UNIX–Windows. IntroductiontoProgrammingLanguages.	
II	**Word Processing:** Open, Save and close word document; Editing text – tools, formatting, bullets;SpellChecker - Document formatting – Paragraph alignment, indentation, headers and footers,numbering;printing– Preview,options,merge.	6
III	**Spreadsheets:** Excel–opening,enteringtextanddata,formatting,navigating;Formulas– entering,handlingand copying;Charts–creating,formatting and printing,analysistables,preparationoffinancialstatements,introductiontodata analytics.	6
IV	**Database Concepts:** The concept of data base management system; Data field, records, and files,Sorting and indexing data; Searching records. Designing queries, and reports; Linking of datafiles; Understanding Programming environment in DBMS; Developing menu drive applicationsinquerylanguage(MS–Access).	6
V	**Power point:** Introduction to Power point - Features – Understanding slide typecasting & viewingslides – creating slide shows. Applying special object – including objects & pictures – Slidetransition– Animationeffects,audioinclusion,timers.	6
	Total	**30**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
1	Possess the knowledge on the basics of computers and its components	PO1,PO2,PO3,PO6,PO8
2	Gain knowledge on Creating Documents, spreadsheet and presentation.	PO1,PO2,PO3,PO6
3	Learn the concepts of Database and implement the Query in Database.	PO3,PO5,PO7
4	Demonstrate the understanding of different automation tools.	PO3,PO4,PO5,PO7
5	Utilize the automation tools for documentation, calculation and presentation purpose.	PO4,PO6,PO7,PO8

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

Mapping with Programme Outcomes:

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

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

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

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

UNIT	Details	No. of Hours	Course Objectives
I	**Overview of C**: Importance of C, sample C program, C program structure, executing C program. Constants, Variables, and Data Types: Character set, C tokens, keywords and identifiers, constants, variables, data types, declaration of variables, Assigning values to variables---Assignment statement, declaring a variable as constant, as volatile. Operators and Expression.	6	CO1
II	**Decision Making and Branching**: Decision making with If, simple IF, IF ELSE, nested IF ELSE , ELSE IF ladder, switch, GOTO statement.**Decision Making and Looping**: While, Do-While, For, Jumps in loops.	6	CO2

III	**Arrays**: Declaration and accessing of one & two-dimensional arrays, initializing two-dimensional arrays, multidimensional arrays.	6	CO3
IV	**Functions**: The form of C functions, Return values and types, calling a function, categories of functions, Nested functions, Recursion, functions with arrays, call by value, call by reference, storage classes-character arrays and string functions	6	CO4
V	**Pointers:** definition, declaring and initializing pointers, accessing a variable through address and through pointer, pointer expressions, pointer increments and scale factor, pointers and arrays, pointers and functions, pointers and structures.	6	CO5
	Total	**30**	

Course Outcomes		**Programme Outcome**
CO	On completion of this course, students will	
1	Remember the program structure of C with its syntax and semantics	PO1,PO3,PO5
2	Understand the programming principles in C (data types, operators, branching and looping, arrays, functions, structures, pointers and files)	PO2,PO3,PO6,PO7
3	Apply the programming principles learnt in real-time problems	PO3,PO4,PO7
4	Analyze the various methods of solving a problem and choose the best method	PO4,PO5,PO6
5	Code, debug and test the programs with appropriate test cases	PO7,PO8

Text Book	
1	E. Balagurusamy, Programming in ANSI C, Fifth Edition, Tata McGraw-Hill, 2010.
Reference Books	
1.	Byron Gottfried, Schaum's Outline Programming with C, Fourth Edition, Tata McGraw-Hill, 2018.
2.	Kernighan and Ritchie, The C Programming Language, Second Edition, Prentice Hall, 1998
3.	YashavantKanetkar, Let Us C, Eighteenth Edition, BPB Publications,2021
Web Resources	
1.	https://codeforwin.org/
2.	https://www.geeksforgeeks.org/c-programming-language/
3.	http://en.cppreference.com/w/c

4.	http://learn-c.org/
5.	https://www.cprogramming.com/

Mapping with Programme Outcomes:

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

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

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	Y	-	-	-	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	15

	C++ :for, while, do - functions in C++ - inline functions – Function Overloading.	
II	Classes and Objects: Declaring Objects – Defining Member Functions – Static Member variables and functions – array of objects –friend functions – Overloading member functions – Bit fields and classes – Constructor and destructor with static members.	15
III	Operator Overloading: Overloading unary, binary operators – Overloading Friend functions –type conversion – Inheritance: Types of Inheritance – Single, Multilevel, Multiple, Hierarchal,Hybrid, Multi path inheritance – Virtual base Classes – Abstract Classes.	15
IV	Pointers – Declaration – Pointer to Class , Object – this pointer – Pointers to derived classes andBase classes – Arrays – Characteristics – array of classes – Memory models – new and deleteoperators – dynamic object – Binding, Polymorphism and Virtual Functions.	15
V	Files – File stream classes – file modes – Sequential Read / Write operations – Binary and ASCIIFiles – Random Access Operation – Templates – Exception Handling - String – Declaring andInitializing string objects – String Attributes – Miscellaneous functions .	15
	Total	**75**

Course Outcomes		**Programme Outcome**
CO	Upon completion of the course the students would be able to:	
1	Remember the program structure of C with its syntax and semantics	PO1,PO6
2	Understand the programming principles in C (data types, operators, branching and looping, arrays, functions, structures, pointers and files)	PO2
3	Apply the programming principles learnt in real-time problems	PO4 ,PO7
4	Analyze the various methods of solving a problem and choose the best method	PO6
5	Code, debug and test the programs with appropriate test cases	PO7,PO8

Text Book

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

Reference Books

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

Web Resources

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

Mapping with Programme Outcomes:

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

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

Title of the Course/ Paper	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
CC4	**C++ PROGRAMMING LAB**	Core	-	-	Y	-	5	5	40	60	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 Inlinefunction.	
2	Write a C++ program to demonstrate Class and Objects	
3	Write a C++ program to demonstrate the concept of Passing Objects to Functions	
4	Write a C++ program to demonstrate the Friend Functions.	
5	Write a C++ program to demonstrate the concept of Passing Objects to Functions	
6	Write a C++ program to demonstrate Constructor and Destructor	

7	Write a C++ program to demonstrate Unary Operator Overloading	
8	Write a C++ program to demonstrate Binary Operator Overloading	
9	Write a C++ program to demonstrate: • Single Inheritance • Multilevel Inheritance • Multiple Inheritance • Hierarchical Inheritance • Hybrid Inheritance	
10	Write a C++ program to demonstrate Virtual Functions.	
11	Write a C++ program to manipulate a Text File.	
12	Write a C++ program to perform Sequential I/O Operations on a file.	
13	Write a C++ program to find the Biggest Number using Command Line Arguments	
14	Write a C++ program to demonstrate Class Template	
15	Write a C++ program to demonstrate Function Template.	
16	Write a C++ program to demonstrate Exception Handling.	

Course Outcomes		**Programme Outcome**
CO	Upon completion of the course the students would be able to:	
1	Remember the program structure of C with its syntax and semantics	PO1,PO6
2	Understand the programming principles in C (data types, operators, branching and looping, arrays, functions, structures, pointers and files)	PO2
3	Apply the programming principles learnt in real-time problems	PO4 ,PO7
4	Analyze the various methods of solving a problem and choose the best method	PO6
5	Code, debug and test the programs with appropriate test cases	PO7,PO8

Text Book	
1	E. Balagurusamy, "Object-Oriented Programming with C++", TMH 2013, 7th Edition.
Reference Books	
1.	Ashok N Kamthane, "Object-Oriented Programming with ANSI and Turbo C++", Pearson Education 2003.
2.	Maria Litvin& Gray Litvin, "C++ for you", Vikas publication 2002.
Web Resources	

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

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	**3**	**3**	**3**	**3**	**1**	**2**
CO 2	**2**	**3**	**3**	**3**	**1**	**2**
CO 3	**2**	**3**	**3**	**3**	**1**	**2**
CO 4	**2**	**3**	**3**	**3**	**1**	**2**
CO 5	**2**	**3**	**3**	**3**	**1**	**2**
Weight age of course contributed to each PSO	11	15	15	15	5	10

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

Title of the Course/ Paper	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
EC2	FINANCIAL ACCOUNTING	Core	Y	-	-	-	3	4	25	75	100

Course Objective	
LO1	To understand the basic accounting concepts and standards.
LO2	To know the basis for accounts, Journals, Ledger
LO3	To know the basis for calculating profit and loss.
LO4	To learn the methods of creating company , ledger creation using Tally
LO5	To gain knowledge about voucher creation.

UNIT	Details	No. of Hours
I	**Financial Accounting:** Meaning, Nature and scope, Limitations – **Accounting Principles :** Basic Concepts and Conventions – Objectives of accounting – Accounting rules.	12
II	**Books and records** : Recording of business transactions – Types of accounts – Journal – Ledger – Journal Vs Ledger, Subsidiary books – Trial balance	12
III	**Final Accounts**: Introduction – Trading account – Profit and loss account – Balance sheet. (Simple problems)	12
IV	**Introduction to Tally:** Features of Tally 9 – Company info: Create, Select, Alter and Close or Shut Company – Ledger Creation: Creating, Displaying, Altering and Deleting. F11 – Features and F12 – Configuration	12
V	**Voucher Creation**: Receipt, Payment, Contra, Journal, Sales, Purchase, Memo, Display, Alter, Delete, Insert, Statement of Reports: Trail balance,	12

	Profit and Loss account, Balance sheet..	
	Total	**60**

Course Outcomes	**Programme Outcome**
Text Book	
1	Financial Accounts – R.S.N. Pillai and Bagavathi, S.Chand, 2007 Unit I: Pg. Numbers – 1 to 22 Unit II : Pg. Numbers – 30 – 65 Unit III: Pg. Numbers – 154 to 170
2	Tallly (version 9) – C.NellaiKannan, 2007 Unit IV : Pg. Numbers – 5 to 61 Unit V : Pg. Numbers – 62 to 102
Reference Books	
1.	Comdex Tally 9 – Dr. NamrataAgrawal, Dream Tech Publications
2.	Tally (Accounting Software) S.Palanivel, Margham Publications, 2010

Mapping with Programme Outcomes:

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

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

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

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

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

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Knows the basic concept in HTML Concept of resources in HTML	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Knows Design concept. Concept of Meta Data Understand the concept of save the files.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Understand the page formatting. Concept of list	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Creating Links. Know the concept of creating link to email address	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Concept of adding images Understand the table creation.	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks

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

Web Resources

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

Mapping with Programme Outcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
SEC3	**Multimedia Systems**	Specific Elective	Y	-	-	-	2	2	25	75	100

Course Objective	
LO1	Understand the definition of Multimedia
LO2	To study about the Image File Formats, SoundsAudio File Formats
LO3	Understand the concepts of Animation and Digital Video Containers
LO4	To study about the Stage of Multimedia Project
LO5	Understand the concept of Ownership of Content Created for Project Acquiring Talent

UNIT	Details	No. of Hours	Course Objective
I	Multimedia Definition-Use Of Multimedia-Delivering Multimedia- Text:About Fonts and Faces - Using Text in Multimedia -Computers and Text Font Editing and DesignTools-HypermediaandHypertext.	6	C1
II	Images: Plan Approach - Organize Tools - Configure Computer Workspace -Making Still Images - Color - Image File Formats. Sound: The Power of Sound - DigitalAudio-MidiAudio-Midivs.DigitalAudio-MultimediaSystemSoundsAudio File Formats - Vaughan's Law of Multimedia Minimums - Adding SoundtoMultimediaProject	6	C2
III	Animation:The Power of Motion-Principles of Animation-Animation by Computer - Making Animations that Work. Video: Using Video -	6	C3

	Working with Video and Displays-DigitalVideoContainers-ObtainingVideo Clips - ShootingandEditingVideo		
IV	Making Multimedia: The Stage of Multimedia Project - The Intangible Needs -The Hardware Needs - The Software Needs - An Authoring Systems Needs-MultimediaProductionTeam.	6	C4
V	PlanningandCosting:TheProcessofMakingMultimedia-Scheduling-Estimating - RFPs and Bid Proposals. Designing and Producing - Content andTalent:AcquiringContent-OwnershipofContentCreatedforProject-AcquiringTalent	6	C5
	Total	**30**	

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
1	understand the concepts, importance, application and the process of developing multimedia	PO1
2	to have basic knowledge and understanding about image related processings	PO1, PO2
3	To understand the framework of frames and bit images to animations	PO4, PO6
4	Speaks about the multimedia projects and stages of requirement in phases of project.	PO4, PO5, PO6
5	Understanding the concept of cost involved in multimedia planning, designing, and producing	PO3, PO8
Text Book		
1	TayVaughan,"Multimedia:MakingItWork",8thEdition,Osborne/McGraw-Hill,2001.	
Reference Books		
1.	RalfSteinmetz&KlaraNahrstedt"MultimediaComputing,Communication&Applications",PearsonEducation,2012.	
Web Resources		
1.	https://www.geeksforgeeks.org/multimedia-systems-with-features-or-characteristics/	

Mapping with Programme Outcomes:

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

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

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

SECOND YEAR
Semester III

Title of the Course/ Paper	**Subject Name**	**Category**	**L**	**T**	**P**	**S**	**Credits**	**Inst. Hours**	**Marks**		
									CIA	**External**	**Total**
CC5	**DATA STRUCTURES AND ALGORITHMS**	Core	Y	-	-	-	5	5	25	75	100

Course Objective		
LO1	To understand the concepts of ADTs	
LO2	To learn linear data structures-lists, stacks, queues	
LO3	To learn Tree structures and application of trees	
LO4	To learn graph 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-applications of lists-PolynomialManipulation- All operations-Insertion-Deletion-Merge-Traversal	15
II	Stack ADT-Operations- Applications- Evaluating arithmetic expressions – Conversion of infix topostfix expression-Queue ADT-Operations-Circular Queue- Priority Queue- deQueueapplications of queues.	15
III	Tree ADT-tree traversals-Binary Tree ADT-expression trees-applications of trees-binary searchtree ADT- Threaded Binary Trees-AVL Trees- B-Tree- B+ Tree – Heap-Applications of heap.	15
IV	Definition- Representation of Graph- Types of graph-Breadth first	15

	traversal – Depth firsttraversal-Topological sort- Bi-connectivity – Cut vertex- Euler circuits-Applications of graphs.	
V	Searching- Linear search-Binary search-Sorting-Bubble sort-Selection sort-Insertion sort-Shellsort-Radix sort-Hashing-Hash functions-Separate chaining- Open Addressing-RehashingExtendible Hashing	15
	Total	**75**

Course Outcomes		**Programmeme Outcome**
CO	On completion of this course, students will	
1	Understand the concept of Dynamic memory management, data types, algorithms, Big O notation	PO1,PO6
2	Understand basic data structures such as arrays, linked lists, stacks and queues	PO2
3	Describe the hash function and concepts of collision and its resolution methods	PO2,PO4
4	Solve problem involving graphs, trees and heaps	PO6,PO8
5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data	PO7

Text Book	
1	1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Pearson Education 2014, 4th Edition.
2	Reema Thareja, "Data Structures Using C", Oxford Universities Press 2014, 2nd Edition
Reference Books	
1.	Thomas H.Cormen,Chales E.Leiserson,Ronald L.Rivest, Clifford Stein, "Introduction to Algorithms", McGraw Hill 2009, 3rd Edition.
2.	Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education 2003
Web Resources	
1.	NPTEL & MOOC courses titled Data Structures
2.	https://nptel.ac.in/courses/106106127/

Mapping with Programme Outcomes:

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

CO 2	**1**	**2**	**1**	**-**	**-**	**-**
CO 3	**3**	**1**	**2**	**1**	**-**	**-**
CO 4	**2**	**2**	**1**	**-**	**-**	**1**
CO 5	**3**	**1**	**1**	**-**	**-**	**-**
Weightage of course contributed to each PSO	12	9	8	1	1	1

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

Title of the Course/ Paper	**Subject Name**	**Category**	**L**	**T**	**P**	**S**	**Credits**	**Inst. Hours**	**Marks**		
									CIA	**External**	**Total**
CC6	**DATA STRUCTURES AND ALGORITHMS LAB using C++**	Core	-	-	Y	-	5	5	40	60	100

Course Objective		
LO1	To understand the concepts of ADTs	
LO2	To learn linear data structures-lists, stacks, queues	
LO3	To learn Tree structures and application of trees	
LO4	To learn graph strutures and application of graphs	
LO5	To understand various sorting and searching	
Sl. No	**Details**	**No. of Hours**
1.	Write a program to implement the List ADT using arrays and linked lists.	
2.	Write a programs to implement the following using a singly linked list. • Stack ADT • Queue ADT	
3.	Write a program that reads an infix expression, converts the expression to postfix form and then evaluates the postfix expression (use stack ADT).	

4.	Write a program to implement priority queue ADT.	
5.	Write a program to perform the following operations: • Insert an element into a binary search tree. • Delete an element from a binary search tree. • Search for a key element in a binary search tree.	
6.	Write a program to perform the following operations • Insertion into an AVL-tree • Deletion from an AVL-tree	
7.	Write a programs for the implementation of BFS and DFS for a given graph.	
8	Write a programs for implementing the following searching methods: • Linear search • Binary search.	
9.	Write a programs for implementing the following sorting methods: • Bubble sort • Selection sort • Insertion sort • Radix sort.	
	Total	

Course Outcomes		**Programmem Outcome**
CO	On completion of this course, students will	
1	Understand the concept of Dynamic memory management, data types, algorithms, Big O notation	PO1,PO4,PO5
2	Understand basic data structures such as arrays, linked lists, stacks and queues	PO1, PO4,PO8
3	Describe the hash function and concepts of collision and its resolution methods	PO1,PO3,PO6
4	Solve problem involving graphs, trees and heaps	PO3,PO4
5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data	PO1,PO5,PO6
Text Book		

1	Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Pearson Education 2014, 4th Edition.
2	Reema Thareja, "Data Structures Using C", Oxford Universities Press 2014, 2nd Edition
Reference Books	
1	Thomas H.Cormen,Chales E.Leiserson,Ronald L.Rivest, Clifford Stein, "Introduction to Algorithms", McGraw Hill 2009, 3rd Edition
2.	Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education 2003
Web Resources	
1.	NPTEL & MOOC courses titled Data Structures
2.	https://nptel.ac.in/courses/106106127/

Mapping with Programme Outcomes:

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

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

Title of the Course/ Paper	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
EC3	**NUMERICAL METHODS**	Core	Y	-	-	-	3	4	25	75	100
Course Objective											
LO1	Calculate algebraic and transactional equations										
LO2	To learn about Simultaneous Equation										
LO3	To learn about interpolation – Gauss method										
LO4	Calculate Numerical Differentiation and Integration										
LO5	To learn about Numerical Solution of Ordinary Differential Equations:										

UNIT	Details	No. of Hours
I	Algebraic and Transcendental Equations: Errors in numerical computationIteration method-Bisection method-Regula-Falsi method-Newton-Raphsonmethod-Horner's method.	12
II	Simultaneous Equations: Introduction-Simultaneous equations-Backsubstitution-Gauss Elimination method-Gauss –Jordan Elimination methodCalculation of Inverse of a matrix- Crout's method-Iterative methods-GaussJacobi Iteration method-Gauss seidal Iteration method-Newton Raphson'smethod for simultaneous equations.	12
III	Interpolation & Introduction: Newton's interpolation Formulae-Central difference Interpolation formulae-Gauss forward, Gauss backward, Lagrange's interpolation formulae- Divided differences-Newton's divided difference formula-Inverse Interpolation.	12
IV	Numerical Differentiation and Integration: Introduction-Derivates using Newton's forward difference formula-Derivates using Newton's backward difference formula- Numerical Integration-Newton-cotes quadrature formulaTrapezoidal Rule-Simpson's one third rule-Simpson's 3/8 th rule.	12
V	Numerical Solution of Ordinary Differential Equations: Introduction-Taylor series method-Picard's method-Euler's method-Runge-kutta method of second, third, fouth order- Predictor & corrector methods-Mile's method.	12
	Total	**60**
	Text Book	
1	Numerical Methods, Second Edition, S.Arumugam, A.Thangapandi Issac, A.Somasundaram, SCITECH publications, 2009. Unit I : Chapter-3 Unit II : Chapter-4 (excluding Relation method and its related problems) Unit III : Chapter-7 (Sections: 7.0, 7.1, 7.2((i), (ii) and relatedproblems); 7.3,7.4,7.5,7.6) Unit IV : Chapter-8 (Sections: 8.0,8.1,8.2 related problems, 8.5(excluding Weddles	

	rule, Booles rule, Romberg's methodand related problems)) Unit V : Chapter-10 (Sections : 10.0,10.1,10.2,10.3(excludingmodified Euler's method & its related problems)10.4,10.5,10.6)
Reference Books	
1.	Mathews J.H. Numerical Method for Maths, Science and Engineering; PHI, New Delhi, 2001.
2.	Iqbal H. Khan & Q. Hassan Numerical Methods for Engineers and Scientist - Galgotia Publications (P) Ltd., New Delhi - 1997.
3.	M.K. Jain, S.R.K. Iyengar & R.K.Jain - Numerical Methods for Scientific and Engineering Computation - New Age International(P) Ltd., New Delhi - 1996

Mapping with Programme Outcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
SEC4	**UNDERSTANDING INTERNET**	Specific Elective	1	-	-		1	25	75	100

Learning Objectives		
LO1	Knowledge of Internet medium	
LO2	Internet as a mass medium	
LO3	Features of Internet Technology,	
LO4	Internetas sourceof infotainment	
LO5	Studyofinternet audiences andabout cyber crime	
UNIT	**Contents**	**No. Of. Hours**
I	Theemergenceofinternet asamassmedium–theworld of'worldwideweb'.	**3**
II	Featuresofinternetasatechnology.	**3**

III	Internetas asourceofinfotainment – classificationbasedoncontentandstyle.	**3**
IV	Demographic and psychographic descriptions of internet 'audiences' – effect of internet onthevalues and life-styles.	**3**
V	Presentissuessuchascybercrime andfuturepossibilities.	**3**
	TOTAL HOURS	**15**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Knows the basic concept in internet Concept of mass medium and world wide web	PO1, PO2, PO3, PO4, PO5, PO6
CO2	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 cyber crime and future possibilities	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks

1	Barnouw, E and Krishnaswamy S [1990] Indian Film. New York, OUP.
2	Kumar, Keval [1999] Mass Communication in India. Mumbai, Jaico.
3	**Srivastava, K M [1992] Media Issues. Sterling Publishers Pvt Ltd.**

Reference Book

1	Acharya, R N [1987] Television in India. Manas Publications, New Delhi.
2	Barnouw, E [1974] Documentary – A History of Nonfiction. Oxford, OUP
3	Luthra, H R [1986] Indian Broadcasting. Ministry of I & B, New Delhi.
4	Vasudev, Aruna [1986] The New Indian Cinema. Macmillan India, New Delhi.

Web Resources

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

Mapping with Programme Outcomes:

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

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

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

Subject Code	**Subject Name**	**Category**	**L**	**T**	**P**	**S**	**Credits**	**Inst. Hours**	**Marks**		
									CIA	**External**	**Total**
SEC5	**Biometrics**	Specific Elective	Y	-	-	-	2	2	25	75	100

Course Objectives	
LO1	Identify the various biometric technologies.
LO2	Design of biometric recognition.
LO3	Develop simple applications for privacy
LO4	Understand the need of biometric in the society
LO5	Understand the scope of biometric techniques

UNIT	**Details**	**No. of Hours**	**Course Objectives**
I	**Introduction**: What is Biometrics, History,Types of biometric Traits, General architecture of biometric systems, Basic working of biometric matching, Biometric system error and performance measures, Design of biometric system, Applications of biometrics, Biometrics versus traditional authentication methods. **Face Biometrics:** Introduction, Background of Face Recognition, Design of Face Recognition System, Neural Network for Face Recognition, Face Detection in Video Sequences, Challenges in Face Biometrics, .7 Face Recognition Methods, Advantages and Disadvantages.	6	CO1
II	**Retina and Iris Biometrics:** Introduction, Performance of Biometrics, Design of Retina Biometrics, Design of Iris Recognition System, Iris Segmentation Method , Determination of Iris Region, Determination of Iris Region, Applications of Iris Biometrics, Advantages and Disadvantages **Vein and Fingerprint Biometrics:** Introduction, Biometrics Using Vein Pattern of Palm, Fingerprint	6	CO2

	Biometrics, Fingerprint Recognition System, Minutiae Extraction, Fingerprint Indexing, Experimental Results, Advantages and Disadvantages.		
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	CO3
IV	**Watermarking Techniques:** Introduction, Data Hiding Methods, Basic Framework of Watermarking, Classification of Watermarking, Applications of Watermarking, Attacks on Watermarks, Performance Evaluation, Characteristics of Watermarks, General Watermarking Process, Image Watermarking Techniques, Watermarking Algorithm, Experimental Results, Effect of Attacks on Watermarking Techniques, Attacks on Spatial Domain Watermarking.	6	CO4
V	**Scope and Future:** Scope and Future Market of Biometrics, Biometric Technologies, Applications of Biometrics, Biometrics and Information Technology Infrastructure, Role of Biometrics in Enterprise Security, Role of Biometrics in Border Security, Smart Card Technology and Biometrics, Radio Frequency Identification (RFID) Biometrics, DNA Biometrics, Comparative Study of Various Biometric Techniques. **Biometric Standards:** Introduction, Standard Development Organizations, Application Programming Interface (API), Information Security and Biometric Standards, Biometric Template Interoperability.	6	CO5
	Total	**30**	

Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	To understand the basic concepts and the functionality of the Biometrics, Face Biometrics, Types, Architecture and Applications.	PO1, PO3, PO6, PO8
CO2	To know the concepts Retina and Iris Biometrics and Vein and Fingerprint Biometrics.	PO1,PO2,PO3,PO6
CO3	To analyse the Privacy Enhancement and Multimodal Biometrics.	PO3, PO5
CO4	To get analyticalidea on Watrmarking Techniques	PO1, PO2, PO3, PO7
CO5	To Gain knowledge on Future scope of Biometrics,and Study of various Biometric Techniques.	PO2, PO6, PO7

Recommended Text	
1.	Biometrics: Concepts and Applications by G.R Sinha and SandeepB.Patil , Wiley, 2013
References Books	
1.	Guide to Biometrics by Ruud M. Bolle , SharathPankanti, Nalinik.Ratha, Andrew W.Senior, Jonathan H. Connell , Springer 2009
2.	Introduction to Biometrics by Anil k. Jain, Arun A. Ross, KarthikNandakumar
3.	nd book of Biometrics by Anil K. Jain, Patrick Flynn, ArunA.Ross.
Web Resources	
1.	https://www.tutorialspoint.com/biometrics/index.htm
2.	https://www.javatpoint.com/biometrics-tutorial
3.	https://www.thalesgroup.com/en/markets/digital-identity-and-security/government/inspired/biometrics

Mapping with Programme Outcomes:

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

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

SEMESTER IV

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
CC7	**Programming IN JAVA**	Core	Y	-	-	-	5	5	25	75	100
Course Objectives											
LO1	To provide fundamental knowledge of object-oriented programming										
LO2	To equip the student with programming knowledge in Core Java from the basics up.										

LO3	To enable the students to use AWT controls, Event Handling and Swing for GUI.		
LO4	To provide fundamental knowledge of object-oriented programming.		
LO5	To equip the student with programming knowledge in Core Java from the basics up.		
UNIT	**Details**	**No. of Hours**	**Course Objectives**
I	**Introduction:**ReviewofObject Orientedconcepts – HistoryofJava – Javabuzzwords – JVMarchitecture – Datatypes - Variables - Scope and life timeofvariables - arrays - operators – controlstatements - type conversion and casting - simple java program - constructors - methods - Static block - Static Data – StaticMethodStringand StringBufferClasses.	15	CO1
II	**Inheritance**: Basic concepts - Types of inheritance - Member access rules - Usage of this and Super key word - Method Overloading - Method overriding - Abstract classes - Dynamic method dispatch - Usage of final keyword. **Packages**:Definition-AccessProtection – ImportingPackages. **Interfaces**:Definition–Implementation–Extending Interfaces. **Exception Handling**: *try – catch - throw - throws – finally* – Built-inexceptions - Creating own Exception classes.	15	CO2
III	**Multithreaded Programming**: Thread Class - Runnable interface –Synchronization–Using synchronizedmethods– Using synchronized statement-InterthreadCommunication –Deadlock. **I/O Streams:** Concepts of streams - Stream classes- Byte and Character stream - Reading console Input and Writing Console output - File Handling.	15	CO3
IV	**AWT Controls:** The AWT class hierarchy - user interface components- Labels - Button - Text Components - Check Box - Check Box Group - Choice - List Box - Panels – Scroll Pane - Menu - Scroll Bar. Working with Frame class - Colour - Fonts and layout	15	CO4

	managers. **Event Handling:** Events - Event sources - Event Listeners - Event Delegation Model (EDM) - Handling Mouse and Keyboard Events - Adapter classes - Inner classes		
V	**Swing:** Introduction to Swing - Hierarchy of swing components. Containers - Top level containers - JFrame - JWindow - JDialog - JPanel - JButton - JToggleButton - JCheckBox - JRadioButton - JLabel,JTextField - JTextArea - JList - JComboBox - JScrollPane.	15	CO5
	Total	**75**	

Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Understand the basic Object-oriented concepts.Implement the basic constructs of Core Java.	PO1, PO2, PO6
CO2	Implement inheritance, packages, interfaces and exception handling of Core Java.	PO2, PO3, PO8
CO3	Implement multi-threading and I/O Streams of Core Java	PO1, PO3, PO7
CO4	Implement AWT and Event handling.	PO2, PO6
CO5	Use Swing to create GUI.	PO1, PO3, PO8

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

Mapping with Programme Outcomes:

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

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

Subject Code	**Subject Name**	**Category**	**L**	**T**	**P**	**S**	**Credits**	**Inst. Hours**	**Marks**		
									CIA	**External**	**Total**
CC8	**Programming in java lab**	Core	-	-	y	-	5	5	40	60	100

Course Objective	
LO1	To provide fundamental knowledge of object-oriented programming.
LO2	To equip the student with programming knowledge in Core Java from the basics up.
LO3	To enable the students to know about Event Handling .
LO4	To enable the students to use String Concepts.
LO5	To equip the student with programming knowledge in to creat GUI using AWT controls.

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

	b. Finding a character at a particular position c. Concatenating two strings	
6	Write a program to perform the following string operations using String class: a. String Concatenation b. Search a substring c. To extract substring from given string	
7	Write a program to perform string operations using String Buffer class: a. Length of a string b. Reverse a string c. Delete a substring from the given string	
8	Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.	
9	Write a threading program which uses the same method asynchronously to print the numbers 1to10 using Thread1 and to print 90 to100 using Thread2.	
10	Write a program to demonstrate the use of following exceptions. a. Arithmetic Exception b. Number Format Exception c. ArrayIndexOutofBoundException d. NegativeArraySizeException	
11	Write a Java program that reads on file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes	
12	Write a program to accept a text and change its size and font. Include bold italic options. Use frames and controls.	
13	Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. (Use adapter classes).	
14	Write a Java program that works as a simple calculator. Use a grid	

	layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divide by zero.	
15	Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "stop" or "ready" or "go" should appear above the buttons in a selected color. Initially there is no message shown.	
	Total	**60**

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

Text Book	
1	Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010.
2.	Gary Cornell, *Core Java 2 Volume I – Fundamentals,* Addison Wesley, 1999.
Reference Books	
1.	Head First Java, O'Rielly Publications,
2.	Y. Daniel Liang, *Introduction to Java Programming*, 7th Edition, Pearson Education India, 2010.
Web Resources	
1.	https://www.w3schools.com/java/
2.	http://java.sun.com
3.	http://www.afu.com/javafaq.html

Mapping with Programme Outcomes:

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

CO 5	3	2	1	3	2	3
Weightage of course contributed to each PSO	15	10	5	15	9	15

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

Title of the Course/ Paper	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
EC4	**RESOURCE MANAGEMENT TECNIQUES**	Core	Y	-	-	-	3	3	25	75	100
Course Objective											
LO1	To provide fundamental knowledge of operation research.										
LO2	Calculate LPP – Slack & Surplus variables										
LO3	To learn about the simplex method										
LO4	To learn about Duality Theorems										
LO5	To learn about Mathematical formulation of Transportation Problem										
UNIT	**Details**										**No. of Hours**
I	Development of OR: Definition of OR – Modeling - Characteristics and Phases - Tools, Techniques & Methods - scope of OR.										9
II	Linear Programming Problem: Formulation - Slack & surplus variables - Graphical solution of LPP.										9
III	Simplex Method: Computational Procedure - Big-M method - Concept of duality in LPP - Definition of primal dual problems - General rules for converting any primal into its dual.										9
IV	Duality Theorems: (without proof) Primal dual correspondence - Duality and Simplex method - Mathematical formulation of assignment problem - Method for solving assignment problem.										9
V	Mathematical formulation of Transportation Problem: Methods for finding IBFS for the Transportation Problems.										9
	Total										**45**

Course Outcomes	Programmeme Outcome
Text Book	
1	Operations Research, S.D.Sharma, Kedar Nath Ram Nath & Co. Unit I : Chapter-1(1.1, 1.2, 1.4,1.,1.8,1.9,1.10,1.11) Unit II : Chapter-3 (3.1, 3.2, 3.3, 3.3.1, 3.3.2, 3.3.3, 3.3.4, 3.4,3.5) Unit III : Chapter-5 (5.1, 5.2, 5.2.1, 5.3,5.4,5.5.4) Chapter- 7 (7.1,7.2,7.3,7.4) Unit IV : Chapter-7 (7.5) (Statements only); 7.6, 7.7 Chapter 11(11.2,11.3,11.4) Unit V : Chapter-12 (12.2 to 12.8)
Reference Books	
1.	Operation Research, Nita H.Shah, Ravi M.Gor and Hardik soni,PrenticeHall of India Pvt. Ltd., New Delhi 2008.
2.	Operation Research, R.Sivarethinamohan, Tata McGraw Hill, 2005.
3.	Operations Research – An Introduction by Hamdy A.Taha. Ninth Edition, Dorling Kindersley Pvt. Ltd., Noida, India, 2012...

Mapping with Programme Outcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
SEC 6	**PHP PROGRAMMING**	Specific Elective	Y				2	2	25	75	100

Course Objective			
LO1	To provide the necessary knowledge on basics of PHP.		
LO2	To design and develop dynamic, database-driven web applications using PHP version.		
LO3	To get an experience on various web application development techniques.		
LO4	To learn the necessary concepts for working with the files using PHP.		
LO5	To get a knowledge on OOPS with PHP.		
UNIT	**Details**	**No. of Hours**	**Course Objectives**

I	Introduction to PHP -Basic Knowledge of websites -Introduction of Dynamic Website -Introduction to PHP -Scope of PHP -XAMPP and WAMP Installation	6	CO1
II	PHP Programming Basics -Syntax of PHP -Embedding PHP in HTML -Embedding HTML in PHP. Introduction to PHP Variable -Understanding Data Types -Using Operators -Using Conditional Statements -If(), else if() and else if condition Statement.	6	CO2
III	Switch() Statements -Using the while() Loop -Using the for() Loop PHP Functions. PHP Functions -Creating an Array -Modifying Array Elements -Processing Arrays with Loops - Grouping Form Selections with Arrays -Using Array Functions.	6	CO3
IV	PHP Advanced Concepts -Reading and Writing Files -Reading Data from a File.	6	CO4
V	Managing Sessions and Using Session Variables -Destroying a Session -Storing Data in Cookies -Setting Cookies.	6	CO5
	Total	**30**	

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
1	Write PHP scripts to handle HTML forms	PO1,PO4,PO6,PO8.
2	Write regular expressions including modifiers, operators, and metacharacters.	PO2,PO5,PO7.
3	Create PHP Program using the concept of array.	PO3,PO6,PO8.
4	Create PHP programs that use various PHP library functions	PO2,PO3,PO5,PO8.
5	Manipulate files and directories.	PO3,PO5,PO6.

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

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

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

Mapping with Programme Outcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
SEC 7	**Advanced Excel**	Specific Elective	Y	-	-	-	2	2	25	75	100

Course Objective	
LO1	Handle large amounts of data
LO2	Aggregate numeric data and summarize into categories and subcategories
LO3	Filtering, sorting, and grouping data or subsets of data
LO4	Create pivot tables to consolidate data from multiple files
LO5	Presenting data in the form of charts and graphs

UNIT	Details	No. of Hours	Course Objective

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

	with PowerPoint / MS Word, Dynamically- New Features Of Excel Spark lines, Inline Charts, data Charts- Overview of all the new features.		
	Total	**30**	

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
1	Work with big data tools and its analysis techniques.	PO1
2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO2
3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO4, PO6
4	Perform analytics on data streams.	PO4, PO5, PO6
5	Learn No-SQL databases and management.	PO3, PO8
Text Book		
1	**Excel 2019 All**	
2	**Microsoft Excel 2019 Pivot Table Data Crunching**	
Reference Books		
Web Resources		
1.	https://www.simplilearn.com	
2	https://www.javatpoint.com	
3	https://www.w3schools.com	

Mapping with Programme Outcomes:

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

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

THIRD YEAR
SEMESTER V

Subject	**Subject Name**	**C a t**	**L**	**T**	**P**	**S**	**C**	**I**	**Marks**

Code									CIA	External	Total
CC9	**Operating Systems**	Core	Y	-	-	-	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 processor scheduling										
LO5	To learn about te concept of memory organization and multiprogramming										

UNIT	Details	No. of Hours	Course Objective
	Introduction: operating system, history (1990s to 2000 and beyond), distributed computing, parallel computation. **Process concepts:** definition of process, process states-Life cycle of a process, process management- process state transitions, process control block(PCB), process operations , suspend and resume, context switching, Interrupts -Interrupt processing, interrupt classes, Inter process communication-signals, message passing.	15	CO1
II	**Asynchronous concurrent processes:** mutual exclusion- critical section, mutual exclusion primitives, implementing mutual exclusion primitives, Peterson's algorithm, software solutions to the mutual Exclusion Problem-, n-thread mutual exclusion- Lamports Bakery Algorithm. Semaphores – Mutual exclusion with Semaphores, thread synchronization with semaphores, counting semaphores, implementing semaphores. **Concurrent programming:** monitors, message passing	15	CO2
III	**Deadlock and indefinite postponement:** Resource concepts, four necessary conditions for deadlock, deadlock prevention, deadlock avoidance and	15	CO3

	Dijkstra's Banker's algorithm, deadlock detection, deadlock recovery.		
IV	**Job and processor scheduling:** scheduling levels, scheduling objectives, scheduling criteria, preemptive vs non-preemptive scheduling, interval timer or interrupting clock, priorities, scheduling algorithms-FIFO scheduling, RR scheduling, quantum size, SJF scheduling, SRT scheduling, HRN scheduling, multilevel feedback queues, Fair share scheduling.	15	CO4
V	**Real Memory organization and Management:**: Memory organization, Memory management, Memory hierarchy, Memory management strategies, contiguous vs non-contiguous memory allocation, single user contiguous memory allocation, fixed partition multiprogramming, variable partition multiprogramming, Memory swapping **Virtual Memory organization:** virtual memory basic concepts, multilevel storage organization, block mapping, paging basic concepts, segmentation, paging/segmentation systems. **Virtual Memory Management:** Demand Paging, Page replacement strategies	15	CO5
	Total	**75**	

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

	with respective algorithms and measures to retrieve from deadlock. .	
4	Have complete knowledge of Scheduling Algorithms and its types.	PO4, PO5, PO6
5	understand memory organization and management	PO3, PO8
Text Book		
1	H.M. Deitel, Operating Systems, Third Edition, Pearson Education Asia, 2011	
Reference Books		
1.	William Stallings, Operating System: Internals and Design Principles, Seventh Edition, Prentice-Hall of India, 2012.	
2.	A. Silberschatz, and P.B. Galvin., Operating Systems Concepts, Nineth Edition, John Wiley &Sons(ASIA) Pte Ltd.,2012	

Mapping with Programme Outcomes:

CO/PSO	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO 1	**3**	**-**	**1**	**2**	**-**	**1**
CO 2	**2**	**3**	**1**	**2**	**-**	**1**
CO 3	**3**	**2**	**-**	**3**	**-**	**1**
CO 4	**1**	**3**	**1**	**1**	**3**	**2**
CO 5	**3**	**-**	**1**	**3**	**2**	**1**
Weightage of course contributed to each PSO	12	8	4	11	5	6

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

Subject Code	**Subject Name**	**Category**	**L**	**T**	**P**	**S**	**Credits**	**Inst. Hours**	**Marks**		
									CIA	**External**	**Total**
CC10	**ASP .Net Programming**	Core	Y	-	-	-	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 standardcontrols.										
LO3	To implement file handling operations.										
LO4	To handles SQL Server Database using ADO.NET.										
LO5	Understand the Grid view control and XML classes.										

UNIT	Details	No. of Hours	Course Objective
I	Overview of .NET framework: Common Language Runtime (CLR), Framework Class Library- C# Fundamentals: Primitive types and Variables – Operators - Conditional statements -Looping statements – Creating and using Objects – Arrays – Stringoperations.	15	C1
II	Introduction to ASP.NET - IDE-Languages supported Components -Working with Web Forms – Web form standard controls: Properties and its events – HTML controls -List Controls: Properties and its events.	15	C2
III	Rich Controls: Properties and its events – validation controls: Properties and its events– File Stream classes - File Modes – File Share – Reading and Writing to files – Creating, Moving, Copying and Deletingfiles – File uploading.	15	C3
IV	ADO.NET Overview – Database Connections – Commands – Data Reader - Data Adapter - Data Sets - Data Controlsand its Properties – DataBinding	15	C4
V	Grid View control: Deleting, editing, Sorting and Paging. XML classes – Web form to manipulate XML files - Website Security - Authentication - Authorization – Creating aWeb application.	15	C5
	Total	**60**	

Course Outcomes		**Programme Outcome**
CO	On completion of this course, students will	
1	Develop working knowledge of C# programming constructs and the .NET Framework	PO1, PO2, PO6
2	To develop a software to solve real-world problems using ASP.NET	PO2, PO3, PO8
3	To Work On Various Controls Files	PO1, PO3, PO7
4	To create a web application using MicrosoftADO.NET.	PO2, PO6
5	To develop web applications using XML	PO1, PO3, PO8

Text Book

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

Mapping with Programme Outcomes:

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

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

Subject	Subject Name	C r e	L	T	P	S	C	I	Marks

Code									CIA	External	Total
CC11	**ASP.Net Programming LAB**	Core	-	-	Y	-	4	5	40	60	100

Course Objective	
LO1	To develop ASP.NET Web application using standardcontrols.
LO2	To create rich database applications usingADO.NET.
LO3	To implement file handling operations.
LO4	To implement XML classes.
LO5	To utilize ASP.NET security features for authenticating the website

Sl. No	**Programs**		**Course Objective**
1.	Create an exposure of Web applications and tools		C1
2.	Implement the Html Controls		
3.	Implement the Server Controls		
4.	Web application using Web controls.		
5.	Web application using List controls.		
6.	Web Page design using Rich control. Validate user input using Validation controls. Working with Fileconcepts.		C2
7.	Web application using Data Controls.		
8.	Data binding with Web controls		
9.	Data binding with Data Controls.		
10.	Database application to perform insert, update and delete operations.		C3
11.	Database application using Data Controls to perform insert, delete, edit, paging and sorting operation.		
12.	Implement the Xml classes.		C4
13.	Implement Authentication – Authorization.		C5
14.	Ticket reservation using ASP.NET controls.		

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

Mapping with Programme Outcomes:

CO/PSO	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO 1	**3**	**2**	**2**	**2**	**1**	1
CO 2	**3**	**2**	**3**	**2**	**2**	2
CO 3	**3**	**3**	**2**	**2**	**1**	1
CO 4	**3**	**2**	**3**	**2**	**1**	1
CO 5	**3**	**2**	**2**	**2**	**1**	2
Weightage of course contributed to each PSO	**15**	11	12	10	6	7

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

SOFTWARE PROJECT MANAGEMENT

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
EC5	5	0	0	VI	3	4	25	75	100

Learning Objectives		
LO1	To define and highlight importance of software project management.	
LO2	To formulate and define the software management metrics & strategy in managing projects	
LO3		
LO4	Understand to apply software testing techniques in commercial environment	
Unit	**Contents**	**No. of Hours**
I	Introduction to Competencies - Product Development Techniques - Management Skills - Product Development Life Cycle - Software Development Process and models - The SEI CMM - International Organization for Standardization.	**12**
II	Managing Domain Processes - Project Selection Models - Project Portfolio Management - Financial Processes - Selecting a Project Team - Goal and Scope of the Software Project -Project Planning - Creating the Work Breakdown Structure - Approaches to Building a WBS - Project Milestones - Work Packages - Building a WBS for Software.	**12**
III	Tasks and Activities - Software Size and Reuse Estimating - The SEI CMM - Problems and Risks - Cost Estimation - Effort Measures - COCOMO: A Regression Model - COCOMO II - SLIM: A Mathematical Model - Organizational Planning - Project Roles and Skills Needed.	**12**
IV	Project Management Resource Activities - Organizational Form and Structure - Software Development Dependencies - Brainstorming - Scheduling Fundamentals - PERT and CPM - Leveling Resource Assignments - Map the Schedule to a Real Calendar - Critical Chain Scheduling.	**12**
V	Quality: Requirements – The SEI CMM - Guidelines - Challenges - Quality Function Deployment - Building the Software Quality Assurance - Plan - Software Configuration Management: Principles - Requirements - Planning and Organizing - Tools - Benefits - Legal Issues in Software - Case Study	**12**
TOTAL		**60**

CO	Course Outcomes
CO1	Understand the principles and concepts of project management
CO2	Knowledge gained to train software project managers

CO3	Apply software project management methodologies.
CO4	Able to create comprehensive project plans
CO5	Evaluate and mitigate risks associated with software development process
Textbooks	
➢	Robert T. Futrell, Donald F. Shafer, Linda I. Safer, "Quality Software Project Management", Pearson Education Asia 2002.
Reference Books	
1.	Pankaj Jalote, "Software Project Management in Practice", Addison Wesley 2002.
2.	Hughes, "Software Project Management", Tata McGraw Hill 2004, 3rd Edition.
NOTE: Latest Edition of Textbooks May be Used	
Web Resources	
1.	NPTEL & MOOC courses titled Software Project Management
2.	www.smartworld.com/notes/software-project-management

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
EC6	**Database Management System**	Core	Y	-	-	-	3	4	25	75	100
Course Objective											
LO1	To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.										
LO2	To understood the concepts of data base management system, design simple Database models										
LO3	To learn and understand to write queries using SQL, PL/SQL.										
LO4	To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.										
LO5	To understood the concepts of data base management system, design simple Database models										

UNIT	Details	No. of Hours	Course Objective
	Database Concepts: Database Systems - Data vs Information - Introducing the database -File system - Problems with file system – Database systems. Data models - Importance - Basic Building Blocks - Business rules - Evolution of Data models - Degrees of Data Abstraction	15	CO1
II	**Design Concepts:** Relational database model - logical view of data-keys -Integrity rules - relational set operators - data dictionary and the system catalog - relationships -data redundancy revisited -indexes - codd's rules. Entity relationship model - ER diagram	15	CO2
III	**Normalization of Database Tables**: Database tables and Normalization – The Need for Normalization –The Normalization Process – Higher level Normal Form.	15	CO3

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

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
1	Understand the various basic concepts of Data Base System. Difference between file system and DBMS and compare various data models.	PO1
2	Define the integrity constraints. Understand the basic concepts of Relational Data Model, Entity-	PO1, PO2

	Relationship Model.	
3	Design database schema considering normalization and relationships within database. Understand and construct database using Structured Query Language. Attain a good practical skill of managing and retrieving of data using Data Manipulation Language (DML)	PO4, PO6
4	Classify the different functions and various join operations and enhance the knowledge of handling multiple tables.	PO4, PO5, PO6
5	Learn to design Data base operations and implement using PL/SQL programs. Learn basics of PL/SQL and develop programs using Cursors, Exceptions	PO3, PO8
Text Book		
1	Coronel, Morris, Rob, "Database Systems, Design, Implementation and Management", Ninth Edition	
2	Nilesh Shah, "Database Systems Using Oracle", 2nd edition, Pearson Education India, 2016	
Reference Books		
1.	Abraham Silberschatz, Henry F.Korth and S.Sudarshan,"Database System Concepts", McGraw Hill International Publication ,VI Edition	
2.	Shio Kumar Singh , "Database Systems ",Pearson publications ,II Edition	
Web Resources		
1.	Web resources from NDL Library, E-content from open-source libraries	

Mapping with Programme Outcomes:

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

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

Title of the Course/ Paper	Subject Name	Categ ory	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
CC 12	**Project with viva voce**	Core	Y	-	-	-	4	5	25	75	100

SEMESTER VI

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
CC13	**Computer Networks**	CORE/ Elective	-	Y	-	-	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	To gain knowledge on Telephone systems using wireless network	PO1, PO2
3	To understand the concept of MAC	PO4, PO6
4	To analyze the characteristics of Routing and Congestion control algorithms	PO4, PO5, PO6
5	To understand network security and define various protocols such as FTP, HTTP, Telnet, DNS	PO3, PO8
Text Book		
1	A. S. Tanenbaum, "Computer Networks", 4th Edition, Prentice-Hall of India, 2008.	
Reference Books		
1.	B. A. Forouzan, "Data Communications and Networking", Tata McGraw Hill, 4th Edition, 2017	
2.	F. Halsall, "Data Communications, Computer Networks and Open Systems", Pearson Education, 2008	
3.	D. Bertsekas and R. Gallagher, "Data Networks", 2nd Edition, PHI, 2008.	
4.	Lamarca, "Communication Networks", Tata McGraw- Hill, 2002	
Web Resources		
1.	https://en.wikipedia.org/wiki/Computer_network	
2.	https://citationsy.com/styles/computer-networks	

Mapping with Programme Outcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
CC14	**DATA ANALYTICS USING R Programming**	Core	Y	-	-	-	4	6	25	75	100

Course Objective	
LO1	To understand the problem solving approaches
LO2	To learn the basic programming constructs in R Programming
LO3	To learn the basic programming constructs in R Programming
LO4	To use R Programming data structures - lists, tuples, and dictionaries.
LO5	To do input/output with files in R Programming.

UNIT	**Details**	**No. of Hours**	**Course Objective**
I	Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating — The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications — Perception and Quantification of Value -Understanding Big Data Storage — A General Overview of High-Performance Architecture — HDFS — MapReduce and YARN — Map Reduce Programming Model	18	C1
II	CONTROL STRUCTURES AND VECTORS -Control structures, functions, scoping rules, dates and times, Introduction to Functions, preview of Some Important R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes Vectors: Generating sequences, Vectors and subscripts, Extracting elements of a vector using subscripts, Working with logical subscripts, Scalars, Vectors,	18	C2

	Arrays, and Matrices, Adding and Deleting Vector Elements, Obtaining the Length of a Vector, Matrices and Arrays as Vectors Vector Arithmetic and Logical Operations, Vector Indexing, Common Vector Operations		
III	LISTS- Lists: Creating Lists, General List Operations, List Indexing Adding and Deleting List Elements, Getting the Size of a List, Extended Example: Text Concordance Accessing List Components and Values Applying Functions to Lists, Data Frames, Creating Data Frames, Accessing Data Frames, Other Matrix-Like Operations	18	C3
IV	FACTORS AND TABLES - Factors and Levels, Common Functions Used with Factors, Working with Tables, Matrix/Array-Like Operations on Tables , Extracting a Sub table, Finding the Largest Cells in a Table, Math Functions, Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions for Statistical Distributions R PROGRAMMING .	18	C4
V	OBJECT-ORIENTED PROGRAMMING S Classes, S Generic Functions, Writing S Classes, Using Inheritance, S Classes, Writing S Classes, Implementing a Generic Function on an S Class, visualization, Simulation, code profiling, Statistical Analysis with R, data manipulation	18	C5
	Total	**90**	

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
1	Work with big data tools and its analysis techniques.	PO1
2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO2

3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO4, PO6
4	Perform analytics on data streams.	PO4, PO5, PO6
5	Learn NoSQL databases and management.	PO3, PO8
Text Book		
1	Roger D. Peng," R Programming for Data Science ", 2012	
2	Norman Matloff,"The Art of R Programming- A Tour of Statistical Software Design", 2011	
Reference Books		
1.	1. Garrett Grolemund, Hadley Wickham,"Hands-On Programming with R: Write Your Own Functions and Simulations" , 1st Edition, 2014	
2.	Venables , W.N.,and Ripley,"S programming", Springer, 2000.	
Web Resources		
1.	https://www.simplilearn.com	

Mapping with Programme Outcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
CC15	**R Programming - LAB**	Core	-	-	Y	-	4	6	40	60	100
Course Objective											

LO1	To understand the problem solving approaches	
LO2	To learn the basic programming constructs in R Programming	
LO3	To practice various computing strategies for R Programming -based solutions to real world problems	
LO4	To use R Programming data structures - lists, tuples, and dictionaries.	
LO5	To do input/output with files in R Programming.	
Sl. No	**Details**	
1.	Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.	
2.	Program, to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.	
3.	Write a program to find list of even numbers from 1 to n using R-Loops.	
4.	Create a function to print squares of numbers in sequence.	
5.	Write a program to join columns and rows in a data frame using cbind() and rbind() in R.	
6.	Implement different String Manipulation functions in R.	
7.	Implement different data structures in R (Vectors, Lists, Data Frames)	
8	Write a program to read a csv file and analyze the data in the file in R.	
9	Create pie chart and bar chart using R.	
10	10. Create a data set and do statistical analysis on the data using R.	
11	Program to find factorial of the given number using recursive function	
12	Write a R program to count the number of even and odd numbers from array of N numbers**.**	
	Total	

Course Outcomes		**Programe Outcome**
CO	On completion of this course, students will	
1	Acquire programming skills in core R Programming	PO1,PO4,PO5
2	Acquire Object-oriented programming skills	PO1, PO4,PO8

	in R Programming.	
3	Develop the skill of designing graphical-user interfaces (GUI) in R Programming	PO1,PO3,PO6
4	Acquire R Programming skills to move into specific branches	PO3,PO4
5		PO1,PO5,PO6
Text Book		
1	Roger D. Peng," R Programming for Data Science ", 2012	
2	Norman Matloff,"The Art of R Programming- A Tour of Statistical Software Design", 2011	
Reference Books		
1	Garrett Grolemund, Hadley Wickham,"Hands-On Programming with R: Write Your Own Functions and Simulations" , 1st Edition, 2014	
2.	Venables , W.N.,and Ripley,"S programming", Springer, 2000.	
Web Resources		
1.	https://www.simplilearn.com	

Mapping with Programme Outcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
EC7	**Cloud Computing**	Elective	-	Y	-	-	3	5	25	75	100
Course Objective											
LO1	Learning fundamental concepts and Technologies of Cloud Computing.										
LO2	Learning various cloud service types and their uses and pitfalls.										
LO3	To learn about Cloud Architecture and Application design.										

LO4	To know the various aspects of application design, benchmarking and security on the Cloud.	
LO5	To learn the various Case Studies in Cloud Computing.	
UNIT	**Details**	**No. of Hours**
I	Introduction to Cloud Computing: Definition of Cloud Computing – Characteristics of Cloud Computing – Cloud Models – Cloud Service Examples – Cloud-based Services and Applications. Cloud Concepts and Technologies: Virtualization – Load balancing – Scalability and Elasticity – Deployment – Replication – Monitoring – Software Defined Networking – Network Function Virtualization – MapReduce – Identity and Access Management – Service Level Agreements – Billing.	15
II	Cloud Services Compute Services: Amazon Elastic Computer Cloud - Google Compute Engine - Windows Azure Virtual Machines Storage Services: Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage Database Services: Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database - Windows Azure Table Service Application Services: Application Runtimes and Frameworks - Queuing Services - Email Services - Notifiction Services - Media Services Content Delivery Services: Amazon CloudFront - Windows Azure Content Delivery Network Analytics Services: Amazon Elastic MapReduce - Google MapReduce Service - Google BigQuery - Windows Azure HDInsight Deployment and Management Services: Amazon Elastic Beanstack - Amazon CloudFormation Identity and Access Management Services: Amazon Identiy and Access Management - Windows Azure Active Directory Open Source Private Cloud Software: CloudStack – Eucalyptus - OpenStack	15

III	**Cloud Application Design:** Introduction – Design Consideration for Cloud Applications – Scalability – Reliability and Availability – Security – Maintenance and Upgradation – Performance – Reference Architectures for Cloud Applications – Cloud Application Design Methodologies: Service Oriented Architecture (SOA), Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller (MVC), RESTful Web Services – Data Storage Approaches: Relational Approach (SQL), Non-Relational Approach (NoSQL).	15
IV	**Cloud Application Benchmarking and Tuning:** Introduction to Benchmarking – Steps in Benchmarking – Workload Characteristics – Application Performance Metrics – Design Consideration for Benchmarking Methodology – Benchmarking Tools and Types of Tests – Deployment Prototyping. **Cloud Security:** Introduction – CSA Cloud Security Architecture – Authentication (SSO) – Authorization – Identity and Access Management – Data Security : Securing data at rest, securing data in motion – Key Management – Auditing.	15
V	**Case Studies:** Cloud Computing for Healthcare – Cloud Computing for Energy Systems - Cloud Computing for Transportation Systems - Cloud Computing for Manufacturing Industry - Cloud Computing for Education.	15
	Total	**75**

Course Outcomes		**Programme Outcome**
CO	On completion of this course, students will	
1	Understand the fundamental concepts and Technologies in Cloud Computing.	PO1
2	Able to understand various cloud service types and their uses and pitfalls.	PO1, PO2
3	Able to understand Cloud Architecture and Application design.	PO4, PO6
4	Understand the various aspects of application design, benchmarking and security in the Cloud.	PO4, PO5, PO6
5	Understand various Case Studies in Cloud Computing.	PO3, PO8

Text Book	
1	ArshdeepBahga, Vijay Madisetti, *Cloud Computing – A Hands On Approach*, Universities Press (India) Pvt. Ltd., 2018
Reference Books	
1.	Anthony T Velte, Toby J Velte, Robert Elsenpeter, *Cloud Computing: A Practical Approach*, Tata McGraw-Hill, 2013.
2.	Barrie Sosinsky, *Cloud Computing Bible*, Wiley India Pvt. Ltd., 2013.
3.	David Crookes, *Cloud Computing in Easy Steps*, Tata McGraw Hill, 2015.
4.	Dr. Kumar Saurabh, *Cloud Computing*, Wiley India, Second Edition 2012.
Web Resources	
1.	https://en.wikipedia.org/wiki/Cloud_computing
2.	https://link.springer.com/chapter/10.1007/978-3-030-34957-8_7
3.	https://webobjects.cdw.com/webobjects/media/pdf/solutions/cloud-computing/121838-CDW-Cloud-Computing-Reference-Guide.pdf

Mapping with Programme Outcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
EC8	**Internet of Things and its applications**		Y	-	-	-	3	5	25	75	100
Course Objective											

LO1	Use of Devices, Gateways and Data Management in IoT.		
LO2	Design IoT applications in different domain and be able to analyze their performance		
LO3	Implement basic IoT applications on embedded platform		
LO4	To gain knowledge on Industry Internet of Things		
LO5	To Learn about the privacy and Security issues in IoT		
UNIT	**Details**	**No. of Hours**	**Course Objective**
I	IoT & Web Technology, The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.	15	C1
II	M2M to IoT – A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.	15	C2
III	IoT Architecture -State of the Art – Introduction, State of the art, Architecture. Reference Model- Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views	15	C3

IV	IoT Applications for Value Creations Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and GasIndustry, Opinions on IoT Application and Value for Industry, Home Management	15	C4
V	Internet of Things Privacy, Security and Governance Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security	15	C5
	Total	**75**	

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
1	Work with big data tools and its analysis techniques.	PO1
2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO2
3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO4, PO6
4	Perform analytics on data streams.	PO4, PO5, PO6
5	Learn NoSQL databases and management.	PO3, PO8

Text Book

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

Reference Books

1. Michael Miller, "The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World", kindle version.

2.	Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, Apress Publications 2013, 1st Edition,.
3	WaltenegusDargie, ChristianPoellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice” 4..CunoPfister, “Getting Started with the Internet of Things”, O" Reilly Media 2011
Web Resources	
1.	https://www.simplilearn.com
2.	https://www.javatpoint.com
3.	https://www.w3schools.com

Mapping with Programme Outcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
SEC8	**SoftwareTesting**	Specific Elective	Y	-	-	-	2	2	25	75	100

Course Objective

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

UNIT	Details	No. of Hours	Course Objective
I	Introduction: Purpose–Productivity and Quality in Software–TestingVsDebugging–Model for Testing–Bugs–Types of Bugs – Testing and Design Style.	6	C1
II	Flow / Graphs and Path Testing – Achievable paths – Path instrumentation Application Transaction FlowTesting Techniques.	6	C2
III	Data Flow Testing Strategies - Domain Testing:Domains and Paths – Domains and Interface Testing.	6	C3
IV	Linguistic –Metrics – Structural Metric – Path Products and Path Expressions.SyntaxTesting–Formats–Test Cases	6	C4
V	Logic Based Testing–Decision Tables–Transition Testing–States, State Graph, StateTesting.	6	C5
	Total	**30**	

Course Outcomes		Program Outcomes
CO	On completion of this course, students will	
1	Students learn to apply software testing knowledge and engineering methods	PO1
2	Have an ability to identify the needs of software test automation, and define and develop a test tool to support test automation.	PO1, PO2
3	Have an ability understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.	PO4, PO6
4	Have basic understanding and knowledge of contemporary issues in software testing, such as	PO4, PO5, PO6

	component-based software testing problems	
5	Have an ability to use software testing methods and modern software testing tools for their testing projects.	PO3, PO8
Text Book		
1	B.Beizer,"SoftwareTestingTechniques",IIEdn.,DreamTechIndia,NewDelhi,2003.	
2	K.V.K.Prasad,"SoftwareTestingTools",DreamTech.India,NewDelhi,2005	
Reference Books		
1.	I.Burnstein,2003,"PracticalSoftwareTesting",SpringerInternationalEdn.	
2.	E. Kit, 1995, "Software Testing in the Real World: Improving the Process", PearsonEducation,Delhi.	
3.	R. Rajani,andP.P.Oak,2004,"SoftwareTesting",TataMcgrawHill,New Delhi.	
Web Resources		
1.	https://www.javatpoint.com/software-testing-tutorial	
2.	https://www.guru99.com/software-testing.html	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	**2**	**3**	**2**	**2**	**2**	**-**
CO 2	**3**	**2**	**2**	**3**	**3**	**2**
CO 3	**2**	**3**	**3**	**2**	**2**	**3**
CO 4	**2**	**1**	**2**	**2**	**2**	**1**
CO 5	**2**	**2**	**3**	**2**	**2**	**2**
Weightage of course contributed to each PSO	11	10	12	11	11	8

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