MANONMANIAMSUNDARANARUNIVERSITY
TIRUNELVELI–12

B.C.A

SYLLABUS

FROMTHEACADEMICYEAR
2024–2025

Introduction

BCA(BachelorofComputer 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 outaspaceforitselflikeanyotherdisciplinesofbasicscienceandengineering. ComputerApplicationis 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 ofproblem 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.

ProgrammeOutcome, ProgrammeSpecificOutcomeandCourseOutcome

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, enhancetheir 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.

LEARNINGOUTCOMES-BASEDCURRICULUMFRAMEWORKGUIDELINES BASED REGULATIONS FOR UNDER GRADUATE PROGRAMME	
Programme:	**B.C.A.,**
ProgrammeCode:	
Duration:	**3years[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:Criticalthinking:**Capabilitytoapplyanalyticthoughtto a body of knowledge; analyze 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 holesin 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, synthesizing and articulating; Ability to recognize cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyze, 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 cooperativeor 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:Scientificreasoning**:Abilitytoanalyze,interpretand 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,withself awarenessandreflexivityofbothself and society. **PO10:Information/digitalliteracy:**CapabilitytouseICTin 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. **PO11: Self-directedlearning**:Abilitytoworkindependently, identify appropriate resources required for a project, and manage a project through to completion. **PO12:Multiculturalcompetence:**Possessknowledgeofthe 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.

	PO13:Moraland ethicalawareness/reasoning:Ability toembrace 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. Capableofdemonstrating theabilityto identifyethicalissues 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; appreciatingenvironmentalandsustainabilityissues; and adopting objective, unbiased and truthful actions in all aspects of work. **PO14: Leadership readiness/qualities:** Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a teamwhocanhelpachievethevision, motivatingandinspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way. **PO15: Lifelong learning:** Ability to acquire knowledge and skills,including ,learninghowtolearn‟,thatarenecessaryforparticipating in learning activities throughout life, through self- paced and self-directed learning aimed at personal development,meetingeconomic,socialandcultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.
Programme Specific Outcomes:	**PSO1**:Toenablestudentstoapplybasicmicroeconomic, macroeconomicandmonetaryconceptsandtheoriesinreal lifeanddecisionmaking. **PSO2**:Tosensitizestudentstovariouseconomicissues relatedtoDevelopment,Growth,InternationalEconomics, SustainableDevelopmentandEnvironment. **PSO3**:Tofamiliarizestudentstotheconceptsandtheories relatedtoFinance,InvestmentsandModernMarketing. **PSO4**:Evaluatevarioussocialandeconomicproblemsinthe societyanddevelopanswertotheproblemsasglobal citizens. **PSO5:**Enhanceskillsofanalyticalandcriticalthinkingto analyzeeffectivenessofeconomicpolicies.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PSO1	Y	Y	Y	Y	Y	Y	Y	Y
PSO2	Y	Y	Y	Y	Y	Y	Y	Y
PSO3	Y	Y	Y	Y	Y	Y	Y	Y
PSO4	Y	Y	Y	Y	Y	Y	Y	Y
PSO5	Y	Y	Y	Y	Y	Y	Y	Y

3–Strong,2-Medium,1-Low

HighlightsoftheRevampedCurriculum:

- Student-centric, meeting the demands of industry & society, incorporating industrial components,hands-ontraining,skillenhancementmodules, industrialproject,projectwith 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 andprovide more job opportunities for the students.
- The Industrial Statistics course is newly introduced in the fourth semester,to expose the studentsto 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, industrial visit, 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 disciplinarynatureareincorporatedasElectivecourses,coveringconventionaltopicstothe latest - Artificial Intelligence.

ValueadditionsintheRevampedCurriculum:

Semester	NewlyintroducedComponents	Outcome/Benefits
I	**FoundationCourse** To ease the transition of learning romhighersecondary to highereducation,providinganover viewofthepedagogy of learningLiteratureandanalyzingth eworld through theliterarylensgivesriseto newperspective.	➢ Instillconfidenceamong students ➢ Create interest forthesubject
I,II,III,IV	**SkillEnhancementpapers**(Disci plinecentric /Generic/Entrepreneurial)	➢ IndustryReadygraduates ➢ Skilledhumanresource ➢ Studentsareequipped with essentialskillsto makethem employable
		➢ Trainingonlanguageand communicationskillsenablet hestudentsgain knowledgeand exposureinthecompetitivewo rld.
		➢ Disciplinecentric skillwillimprovetheTechnica lknow howofsolvingreallife problems.
III,IV,V&VI	Electivepapers	➢ Strengthening thedomainknowledge ➢ Introducing thestakeholdersto theState-of Arttechniquesfromthe streamsofmulti-disciplinary,crossdisciplinar yandinterdisciplinarynature ➢ Emerging topics inhighereducation/industry/c ommunicationnetwork/healt hsectoretc.areintroducedwith hands-on-training.

IV	ElectivePapers	➢ Exposuretoindustrymoldsstudentsintosolutionproviders ➢ GeneratesIndustryready graduates ➢ Employmentopportunitiesenhanced
V	Electivepapers	➢ Self-learningis enhanced ➢ Applicationoftheconcepttorealsituationisconceivedresulting intangibleoutcome
VI	Electivepapers	➢ Enrichesthe studybeyondthecourse. ➢ Developingaresearchframeworkandpresentingtheirindependentand intellectualideas effectively.
ExtraCredits: ForAdvancedLearners/Honorsdegree		➢ Tocatertotheneedsofpeerlearners/research aspirants
SkillsacquiredfromtheCourses	Knowledge, Problem Solving, Analytical ability,ProfessionalCompetency,ProfessionalCommunicationandTransferrableSkill	

CreditDistributionforUGProgramme

SemI	Credit	Sem II	Credit	Sem III	Credit	Sem IV	Credit	SemV	Credit	Sem VI	Credit
1.1.Language-Tamil	3	2.1.Language -Tamil	3	3.1.Language-Tamil	3	4.1.Language-Tamil	3	5.1CoreCourse– \CCIX	4	6.1CoreCourse– CCXIII	4
1.2English	3	2.2English	3	3.2English	3	4.2English	3	5.2CoreCourse– CCX	4	6.2CoreCourse– CC XIV	4
1.3CoreCourse– CCI	5	2.3 Core Course–CC III	5	3.3CoreCourse– CCV	5	4.3CoreCourse– CC VII CoreIndustry Module	5	5.3.CoreCourse CC -XI	4	6.3CoreCourse– CC XV	4
1.4CoreCourse– CC II	5	2.4 Core Course–CC IV	5	3.4CoreCourse– CC VI	5	4.4CoreCourse– CCVIII	5	5.3.CoreCourse–/ Projectwith viva-voce CC-XII	4	6.4Elective -VII Generic/Discipline Specific	3
1.5Elective I Generic/Discipline Specific	3	2.5ElectiveII Generic/ Discipline Specific	3	3.5Elective III Generic/Discipline Specific	3	4.5ElectiveIV Generic/ Discipline Specific	3	5.4Elective V Generic/Discipline Specific	3	6.5 Elective VIII Generic/ Discipline Specific	3
1.6 Skill EnhancementCourse SEC-1 (NME)	2	2.6 Skill Enhancement Course SEC-2(NME)	2	3.6 Skill Enhancement Course SEC-4, (Entrepreneurial Skill)	1	4.6Skill Enhancement Course SEC-6	2	5.5Elective VI Generic/Discipline Specific	3	6.6Extension Activity	1
1.7 Skill Enhancement - (FoundationCourse)	2	2.7 Skill Enhancement Course–SEC-3(NME)	2	3.7 Skill Enhancement CourseSEC-5	2	4.7Skill Enhancement CourseSEC-7	2	5.6ValueEducation	2	6.7Professional CompetencySkill	2
				3.8E.V.S		4.8E.V.S	2	5.7 Summer Internship/Industrial Training	2		
	23		**23**		**22**		**25**		**26**		**21**
	TotalCreditPoints										**140**

CREDITDISTRIBUTIONFORU.G.

3– YearUG Programme CreditsDistribution			
		No. of Papers	**Credits**
PartI	Tamil(3Credits)	4	12
PartII	English(3Credits)	4	12
PartIII	CoreCourses(4Credits)	15	68
	ElectiveCourses:Generic/ DisciplineSpecific (3Credits)	8	24
		Total	**116**
PartIV	NME(2Credits)	2	4
	SkillEnhancementCourses(7 courses) Entrepreneurial Skill -1 ProfessionalCompetencySkill EnhancementCourse	1	13 2
	EVS(2Credits)	1	2
	ValueEducation(2Credits)	1	2
		PartIV Credits	**23**
PartV	ExtensionActivity(NSS/ NCC/ Physical Education)		1
	TotalCreditsfortheUG Programme		**140**

ConsolidatedSemesterwiseandComponentwiseCreditdistribution

Parts	SemI	SemII	SemIII	SemIV	SemV	SemVI	Total Credits
PartI	3	3	3	3	-	-	12
PartII	3	3	3	3	-	-	12
PartIII	13	13	13	13	22	18	92
PartIV	4	4	3	6	4	2	23
PartV	-	-	-	-	-	1	1
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

MethodsofEvaluation		
Internal Evaluation	ContinuousInternalAssessmentTest	25 Marks
	Assignments	
	Seminars	
	AttendanceandClassParticipation	
External Evaluation		75 Marks
	Total	100 Marks
MethodsofAssessment		
Recall(K1)	Simpledefinitions,MCQ,Recallsteps,Conceptdefinitions	
Understand/ Comprehend(K2)	MCQ,True/False,Shortessays,Conceptexplanations,Shortsummaryor overview	
Application(K3)	Suggestidea/conceptwithexamples,Suggestformulae,Solveproblems, Observe,Explain	
Analyze(K4)	Problem-solvingquestions,Finishaprocedureinmanysteps,DifferentiateBetweenvariousideas,Mapknowledge	
Evaluate(K5)	Longeressay/Evaluationessay,Critiqueorjustifywithprosandcons	

B.C.A

First Year
Semester-I

Part	Courses	Credit	Hours perweek (L/T/P)
Part-I	Language–Tamil	3	6
Part-II	English	3	6
Part-III	CC1Python Programming	5	5
	CC2Python Lab	5	5
	EC1DiscreteMathematics-I/Numerical Methods	3	4
Part-IV	SEC1Office Automation Lab	2	2
	FCFundamentals of Information Technology	2	2
		23	**30**

Semester-II

Part	Courses	Credit	Hours perweek (L/T/P)
Part-I	Language–Tamil	3	6
Part-II	English	3	4
Part-III	CC3Object Oriented Programming Concepts using C++	5	5
	CC4C++ Programming Lab	5	5
	EC2Digital Logic Fundamentals/Optimization Techniques	3	4
Part-IV	SEC2Web Designing	1	2
	SEC3HTML Lab	1	2
	AECC1NaanMudhalvan	2	2
		23	**30**

Second Year

Semester-III

Part	Courses	Credit	Hoursper week(L/T/P)
Part-I	Language–Tamil	3	6
Part-II	English	3	6
Part-III	CC5Data Structures and Algorithms	5	5
	CC6 Data Structures and Algorithms using C++ Lab	4	4
	EC3 Microprocessor and Microcontroller/Cyber Forensics	3	3
Part-IV	SEC4 PHP Programming Lab	2	2
	AECC2NaanMudhalvan	2	2
	EnvironmentalStudies	2	2
		24	**30**

Semester-IV

Part	Courses	Credit	Hoursper week(L/T/P)
Part-I	Language–Tamil	3	6
Part-II	English	3	6
Part-III	CC7Java Programming	5	5
	CC8Java Programming Lab	4	4
	EC4Financial Accounting/Cloud Computing	3	3
Part-IV	SEC5Multimedia Systems Lab	2	2
	AECC3NaanMudhalvan	2	2
	ValueEducation	2	2
		24	**30**

Third Year

Semester-V

Part	Courses	Credit	Hours perweek (L/T/P)
Part-III	CC9Operating Systems	4	5
	CC10 ASP.Net Programming	4	5
	CC11 ASP .Net Programming Lab	4	5
	CC12 Project withVivaVoce	3	5
	EC5Software Project Management /Agile Project Management	3	4
	EC6Artificial Intelligence/Machine Learning	3	4
PartIV	AECC4NaanMudhalvan	2	2
	Internship/IndustrialVisit/FieldVisit/KnowledgeUpdationActivity	2	-
		25	**30**

Semester-VI

Part	Courses	Credit	Hours perweek (L/T/P)
Part-III	CC13RDBMS with PL/SQL	4	6
	CC14ImageProcessing	4	6
	CC15 PL/SQL Lab	4	6
	EC7Robotics and Its Applications/ Computer Networks	3	5
	EC8 Introduction to Data Science/Data Mining and Warehousing	3	5
PartIV	AECC5NaanMudhalvan	2	2
Part V	ExtensionActivity	1	-
		21	**30**

TotalCredits:140

Internship(minimum of 30 hours)**:** The students should submit certificate of attendance from the industrystating the nature of work done, duration and role played along with report (minimum of 20 pages) at the end of V semester for external evaluation.

IndustrialVisit/FieldVisit :A report based on the observation and learning outcome to be submitted (minimum of 10 pages) along with suitable evidencesat the end of V semester for external evaluation.

KnowledgeUpdationActivity:A report to be submitted (minimum of 10 pages) based onthe study made along with the completion certificate stating the work done (MOOC/NPTEL) at the end of V semester for external evaluation.

Internship/IndustrialVisit/FieldVisit/KnowledgeUpdationActivity:
Internal–50Marks, External – 50 Marks

Project: GroupProjectreportshouldbesubmitted for external evaluation.
Internal– 50Marks, External– 50Marks

ExtensionActivity(NSS/NCC/YRC/RRC/Games and Sports/ Youth Welfare Activities OutreachProgrammes/Migration Awareness in the Tamil Nadu Education System) :
Individualreportshouldbesubmitted at the end of VI semester for external evaluation.
Internal– 50 Marks, External – 50 Marks

Ability Enhancement CompulsoryCourse: The students who reappear for Naan Mudhalvancours**e** shall write the substitute paper.

Ability Enhancement CompulsoryCourse(AECC) : The students who reappear for Naan Mudhalvancours**e** shall write the substitute paper.

II Semester- Understanding IT
III Semester - OrganizationalBehaviour
IV Semester - Advanced Excel
V Semester - Problem Solving Techniques
VI Semester - Open Source Technologies

There shall only be an external examination for those papers.
No Internal Marks, External – 100 Marks

CORE COURSES
&
FOUNTATION COURSE

FIRST YEAR

SEMESTER I

Title of the Course/ Paper	Subject Name	Category	L	T	P	Credits	Marks		
							CIA	External	Total
CC1	PYTHON PROGRAMMING	**Core**	5			5	25	75	100
Learning Objectives									
LO1	To understand the concepts of Python programming.								
LO2	To develop Python program using control, iterative statements.								
LO3	To impart knowledge on list, dictionaries and tuples.								
LO4	To get knowledge on modules.								
LO5	To know about file handling.								
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	**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 of 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

Text Books

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

Title of the Course/ Paper	Subject Name	Category	L	T	P	Credits	Marks		
							CIA	External	Total
CC2	PYTHON LAB	**Core Lab**	-	-	5	5	50	50	100

Course Objectives:

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

EXERCISES	**No. of 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.	**75**

Course Outcomes

On completion of this course, students will

CO1	Demonstrate the understanding of syntax and semantics of statements.
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

Foundation Course

Subject Code	Subject Name	Category	L	T	P	Credits	Marks		
							CIA	External	Total
FC	FUNDAMENTALS OF INFORMATION TECHNOLOGY	FC	2			2	25	75	100

Learning Objectives	
LO1	Understand the basic concepts and terminology of information technology
LO2	Have a basic understanding of personal computers and their operation
LO3	Be able to identify data storage and its usage
LO4	Get great knowledge of software and its functionalities
LO5	Understand about operating systems and their uses

UNIT	Contents	No. of. Hours
I	**Introduction to Computers** Introduction, Definition, .Characteristics of computer, Evolution of Computer, Block Diagram of a computer, Generations of Computer, Classification ofComputers, Applications ofComputer, Capabilities and limitations of computer	6
II	**Basic Computer Organization** Role of I/O devices in a computer system. Input Units: Keyboard, Terminals and its types. Pointing Devices, Scanners and its types, Voice Recognition Systems, Vision Input System, Touch Screen, Output Units: Monitors and its types. Printers: Impact Printers and its types. Non Impact Printers and its types, Plotters, types of plotters, Sound cards, Speakers.	6
III	**Storage Fundamentals** Primary Vs Secondary Storage, Data storage & retrieval methods. Primary Storage: RAM ROM, PROM, EPROM, EEPROM. Secondary Storage: Magnetic Tapes, Magnetic Disks. Cartridgetape, hard disks, Floppy disks Optical Disks, Compact Disks, Zip Drive, Flash Drives	6
IV	**Software** Software and its needs,Types of S/W. System Software: Operating System, Utility Programs Programming Language: Machine Language, Assembly Language, High Level Language their advantages & disadvantages. Application S/W and its types: Word Processing, Spread Sheets Presentation, Graphics, DBMS	6
V	**Operating System** Functions, Measuring System Performance, Assemblers, Compilers and Interpreters.Batch Processing, Multiprogramming, Multi Tasking, Multiprocessing, Time Sharing, DOS, Windows,Unix/Linux.	6
Total		30

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Learn the basics of computer, Construct the structure of the required things in computer, learn how to use it.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Develop organizational structure using for the devices present currently under input or output unit.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Concept of storing data in computer using two headers namely RAM and ROM with different types of ROM with advancement instorage basis.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Work with different software, Write program in the software and applications of software.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Usage of Operating system in information technology which really acts as a interpreter between software and hardware.	PO1, PO2, PO3, PO4, PO5, PO6
Text Books		
1	Anoop Mathew, S. KavithaMurugeshan (2009), " Fundamental of Information Technology", Majestic Books.	
2	Alexis Leon, Mathews Leon," Fundamental of Information Technology", 2nd Edition.	
3	S. K Bansal, "Fundamental of Information Technology".	
Reference Books		
1.	Bhardwaj Sushil Puneet Kumar, "Fundamental of Information Technology"	
2.	GG WILKINSON, "Fundamentals of Information Technology", Wiley-Blackwell	
3.	A Ravichandran , "Fundamentals of Information Technology", Khanna Book Publishing	
Web Resources		
1.	https://testbook.com/learn/computer-fundamentals	
2.	https://www.tutorialsmate.com/2020/04/computer-fundamentals-tutorial.html	
3.	https://www.javatpoint.com/computer-fundamentals-tutorial	
4.	https://www.tutorialspoint.com/computer_fundamentals/index.htm	
5.	https://www.nios.ac.in/media/documents/sec229new/Lesson1.pdf	

Mapping with Programme Outcomes:

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

SEMESTER II

Title of the Course/ Paper	Subject Name	Category	L	T	P	Credits	Marks		
							CIA	External	Total
CC3	**OBJECT ORIENTED PROGRAMMING CONCEPTS USING C++**	Core	5			5	25	75	100
Course Objectives									
LO1	Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects								
LO2	Understand dynamic memory management techniques using pointers, constructors, destructors, etc.								
LO3	Describe the concept of function overloading, operator overloading, virtual functions and polymorphism								
LO4	Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming								
LO5	Demonstrate the use of various OOPs concepts with the help of programs								
UNIT	**Details**								**No. of Hours**
I	Introduction to C++ - key concepts of Object-Oriented Programming – Advantages – Object Oriented Languages – I/O in C++ - C++ Declarations. Control Structures : - Decision Making and Statements : If ..else, jump, goto, break, continue, Switch case statements - Loops in C++ :for, while, do - functions in C++ - inline functions – Function Overloading.								15
II	Classes and Objects: Declaring Objects – Defining Member Functions – Static Member variables and functions – array of objects –friend functions – Overloading member functions – 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 and Base classes – Arrays – Characteristics – array of classes – Memory models – new and delete operators – dynamic object – Binding, Polymorphism and Virtual Functions.	15
V	Files – File stream classes – file modes – Sequential Read / Write operations – Binary and ASCII Files – Random Access Operation – Templates – Exception Handling - String – Declaring and Initializing string objects – String Attributes – string 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	Credits	Marks		
							CIA	External	Total
CC4	**C++ PROGRAMMING LAB**	Core Lab	-	-	5	5	50	50	100

Course Objectives	
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	**EXERCISES**	**No. of Hours**
1	Write a C++ program to demonstrate function overloading, Default Arguments and Inline function.	**75**
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 Friend Functions.	
5	Write a C++ program to demonstrate Constructor and Destructor	
6	Write a C++ program to demonstrate Unary Operator Overloading	
7	Write a C++ program to demonstrate Binary Operator Overloading	
8	Write a C++ program to demonstrate: • Single Inheritance • Multilevel Inheritance	

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

Course Outcomes		**Programme Outcomes**
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 Resource	
1.	https://alison.com/course/introduction-to-c-plus-plus-programming

Mapping with Programme Outcomes:

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

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

SECOND YEAR

SEMESTER III

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

Course Objectives		
LO1	To understand the concepts of ADTs	
LO2	To learn linear data structures-lists, stacks, queues	
LO3	To learn Tree structures and application of trees	
LO4	To learn graph structures and application of graphs	
LO5	To understand various sorting and searching	
UNIT	**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 traversal – Depth firsttraversal-Topological sort- Bi-connectivity – Cut vertex- Euler circuits-Applications of graphs.	15
V	Searching- Linear search-Binary search-Sorting-Bubble sort-Selection sort-Insertion sort-Shellsort-Radix sort-Hashing-Hash functions-	15

	Separate chaining- Open Addressing-RehashingExtendible Hashing	
	Total	**75**

Course Outcomes		**Programme Outcomes**
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	Credits	Marks		
							CIA	External	Total
CC6	**DATA STRUCTURES AND ALGORITHMS using C++LAB**	Core Lab	-	-	4	4	50	50	100

Course Objectives		
LO1	To understand the concepts of ADTs	
LO2	To learn linear data structures-lists, stacks, queues	
LO3	To learn Tree structures and application of trees	
LO4	To learn graph structures and application of graphs	
LO5	To understand various sorting and searching	
Sl. No	**Details**	**No. of Hours**
1.	Write a program to implement the List ADT using arrays and linked lists.	**60**
2.	Write aprogramto 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 programto 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 aprogramto perform the following operations • Insertion into an AVL-tree • Deletion from an AVL-tree	

7.	Write a program for the implementation of BFS and DFS for a given graph.	
8	Write aprogram for implementing the following searching methods: • Linear search • Binary search.	
9.	Write a programfor implementing the following sorting methods: • Bubble sort • Selection sort • Insertion sort • Radix sort.	

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

SEMESTER IV

Subject Code	Subject Name	Category	L	T	P	Credits	Marks		
							CIA	External	Total
CC7	**Java Programming**	Core	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 Swing.								

UNIT	Details	No. of Hours	Course Objectives
I	**Introduction:**ReviewofObject Orientedconcepts – HistoryofJava – Javabuzzwords – JVMarchitecture - Datatypes - Variables - Scope and life timeofvariables - arrays - operators – controlstatements - type conversion and casting - simple java program - constructors - methods - Static block - Static Data – StaticMethodStringand StringBufferClasses.	15	CO1
II	**Inheritance**: Basic concepts - Types of inheritance - Member access rules - Usage of this and Super key word - Method Overloading - Method overriding - Abstract classes - Dynamic method dispatch - Usage of final keyword. **Packages**:Definition-AccessProtection - ImportingPackages. **Interfaces**:Definition–Implementation–Extending Interfaces. **Exception Handling**: try – catch - throw - throws– finally– Built-inexceptions - Creating own Exception classes.	15	CO2

III	**Multithreaded Programming**: Thread Class - Runnable interface –Synchronization–Using synchronizedmethods– Using synchronized statement-InterthreadCommunication –Deadlock. **I/O Streams:** Concepts of streams - Stream classes- Byte and Character stream - Reading console Input and Writing Console output - File Handling.	15	CO3
IV	**AWT Controls:** The AWT class hierarchy - user interface components- Labels - Button - Text Components - Check Box - Check Box Group - Choice - List Box - Panels – Scroll Pane - Menu - Scroll Bar. Working with Frame class - Colour - Fonts and layout managers. **Event Handling:** Events - Event sources - Event Listeners - Event Delegation Model (EDM) - Handling Mouse and Keyboard Events - Adapter classes - Inner classes	15	CO4
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'Reilly Publications
2.	Y. Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson Education India, 2010
Web Resources	
1.	https://javabeginnerstutorial.com/core-java-tutorial
2.	http://docs.oracle.com/javase/tutorial/
3.	https://www.coursera.org/

Mapping with Programme Outcomes:

CO/PSO	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	**Java Programming Lab**	Core Lab	-	-	4	-	4	-	50	50	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 know about Event Handling .
LO4	To enable the students to use String concepts.
LO5	To equip the student with programming knowledge in to create GUI using AWT controls.

UNIT	Details	No. of Hours
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 text	
4	Generate random numbers between two given limits using Random class and print messages according to the range of the value generated.	
5	Write a program to do String Manipulation using Character array andperform 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	60
7	Write a program to perform string operations using String Bufferclass: 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 followingexceptions. a. Arithmetic Exception b. Number Format Exception c. ArrayIndexOutofBoundException d. NegativeArraySize exception	
11	Write a Java program that reads on file name from the user,	

	then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes	
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.	

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'Reilly 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

THIRD YEAR

SEMESTER V

Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks		
								CIA	External	Total
CC9	**Operating Systems**	Core	5			4		25	75	100
Course Objectives										
LO1	Understanding the design of the Operating System									
LO2	Imparting knowledge on CPU scheduling, Process and Memory Management.									
LO3	To code specialized programs for managing overall resources and operations of the computer.									
LO4	To study about the concept of Job and Processor scheduling									
LO5	To learn about the concept of memory organization and multiprogramming									
UNIT	**Details**						**No. of Hours**	**Course Objective**		
I	**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,						15	CO2		

	counting semaphores, implementing semaphores. **Concurrent programming:** monitors, message passing		
III	**Deadlock and indefinite postponement:** Resource concepts, four necessary conditions for deadlock, deadlock prevention, deadlock avoidance and Dijkstra's Banker's algorithm, deadlock detection, deadlock recovery.	15	CO3
IV	**Job and processor scheduling:** scheduling levels, scheduling objectives, scheduling criteria, preemptive vs non-preemptive scheduling, interval timer or interrupting clock, priorities, scheduling algorithms-FIFO scheduling, RR scheduling, quantum size, SJF 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	PO1

	theconcepts relevant to process , process life cycle, Scheduling Algorithms, Deadlock and Memory management	
2	Know the critical analysis of process involving various algorithms, an exposure to threads and semaphores	PO1, PO2
3	Have a complete study about Deadlock and its impact over OS. Knowledge of handling Deadlock with respective algorithms and measures to retrieve from deadlock. .	PO4, PO6
4	Have complete knowledge of Scheduling Algorithms and its types.	PO4, PO5, PO6
5	Understand memory organization and management	PO3, PO8
Text Book		
1	H.M. Deitel, Operating Systems, Third Edition, Pearson Education Asia, 2011	
Reference Books		
1.	William Stallings, Operating System: Internals and Design Principles, Seventh Edition, Prentice-Hall of India, 2012.	
2.	A. Silberschatz, and P.B. Galvin., Operating Systems Concepts, Nineth Edition, John Wiley &Sons(ASIA) Pte Ltd.,2012	

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		5			4		25	75	100
Course Objectives											
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	**75**	

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

Text Book	
1	SvetlinNakov,VeselinKolev& Co, Fundamentals of Computer Programming with C#,Faber Publication,2019.
2	Mathew, Mac Donald, The Complete Reference ASP.NET, Tata McGraw-Hill,2015.

Reference Books	
1.	Herbert Schildt, The Complete Reference C#.NET, TataMcGraw-Hill,2017.
2.	Kogent Learning Solutions, C# 2012 Programming Covers .NET 4.5 Black Book, Dreamtech pres,2013.
3.	Anne Boehm, Joel Murach, Murach's C# 2015, Mike Murach& Associates Inc.2016.
4.	DenielleOtey, Michael Otey, ADO.NET: The Complete reference, McGrawHill,2008.
5.	Matthew MacDonald, Beginning ASP.NET 4 in C# 2010,APRESS,2010.

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

Mapping with Programme Outcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
CC11	**ASP.Net Programming LAB**	Core Lab	-	-	5	-	4		50	50	100

Course Objectives	
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	**Exercises**	**Course Objectives**
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	

Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
1	Create web applications and implement various controls	PO1, PO2, PO6
2	Create a web page 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 Books	
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 press,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- 1

SEMESTER VI

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
CC13	**RDBMS with PL/SQL**	Core	6		-	-	4		25	75	100

Course Objectives	
LO1	Describe basic concepts of database system
LO2	Design a Data model and Schemas in RDBMS
LO3	Competent in use of SQL
LO4	Analyze functional dependencies for designing robust Database
LO5	Describe basic concepts of database system

UNIT	**Details**	**No. of Hours**
I	Introduction to DBMS– Data and Information - Database – Database Management System – Objectives - Advantages – Components - Architecture. ER Model: Building blocks of ER Diagram – Relationship Degree – Classification – ER diagram to Tables – ISA relationship – Constraints – Aggregation and Composition – Advantages	18
II	Relational Model:CODD's Rule- Relational Data Model -Key-Integrity– Relational Algebra Operations – Advantages and limitations – Relational Calculus – Domain Relational Calculus - QBE.	18
III	Structure of Relational Database. Introduction to Relational Database Design - Objectives – Tools – Redundancy and Data Anomaly – Functional Dependency - Normalization – 1NF – 2NF – 3NF – BCNF. Transaction Processing – Database Security.	18
IV	SQL: Commands – Data types – DDL - Selection, Projection,Join and Set Operations – Aggregate Functions – DML – Modification - Truncation - Constraints – Subquery.	18
V	PL/SQL: Structure - Elements – Operators Precedence – Control Structure – Iterative Control - Cursors - Procedure - Function - Packages – Exceptional Handling - Triggers.	18
	Total	**90**

Course Outcomes		**Programme Outcome**
CO	On completion of this course, students will	
1	Understand thebasic concepts of database system	PO1
2	Design a Data model and Schemas in RDBMS	PO1, PO2
3	Competent in use of SQL	PO4, PO6
4	Analyze functional dependencies for designing robust Database	PO4, PO5, PO6
5	Understand basic concepts of database system	PO3, PO8

Text Book	
1	S. Sumathi, S. Esakkirajan, "Fundamentals of Relational Database Management System", Springer International Edition 2007.
Reference Books	
1	Abraham Silberchatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGrawHill 2019, 7th Edition.
2	Alexis Leon & Mathews Leon, "Fundamentals of DBMS", Vijay Nicole Publications 2014, 2nd Edition.
Web Resources	
1.	NPTEL & MOOC courses titled Relational Database Management Systems
2.	https://nptel.ac.in/courses/106106093/
3.	https://nptel.ac.in/courses/106106095/

Mapping with Programme Outcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks		
								CIA	External	Total
CC14	**Image Processing**	Core	6			4		25	75	100
Course Objectives										
LO1	To learn fundamentals of digital image processing.									
LO2	To learn about various 2D Image transformations									
LO3	To learn about various image enhancement processing methods and filters									
LO4	To learn about various classification of image segmentation techniques									
LO5	To learn about various image compression techniques									

UNIT	Details	No. of Hours
I	**Digital Image Fundamentals:** Image representation - Basic relationship between pixels, Elements of DIP system -Applications of Digital Image Processing - 2D Systems - Classification of 2D Systems - Mathematical Morphology- Structuring Elements- Morphological Image Processing - 2D Convolution - 2D Convolution Through Graphical Method -2D Convolution Through Matrix Analysis	18
II	2D Image transforms: Properties of 2D-DFT - Walsh transform - Hadamard transform- Haar transform- Discrete Cosine Transform- Karhunen-Loeve Transform -Singular Value Decomposition	18
III	Image Enhancement: Spatial domain methods- Point processing- Intensity transformations - Histogram processing- Spatial filtering- smoothing filter- Sharpening filters - Frequency domain methods: low pass filtering, high pass Filtering- Homomorphic filter	18
IV	Image segmentation: Classification of Image segmentation techniques - Region approach – Clustering techniques - Segmentation based on thresholding - Edge based segmentation - Classification of edges- Edge detection - Hough transform- Active contour	18
V	Image Compression: Need for compression -Redundancy- Classification of image- Compression schemes- Huffman coding- Arithmetic coding-	18

	Dictionary based compression -Transform based compression	
	Total	**90**

Course Outcomes		**Programme Outcome**
CO	On completion of this course, students will	
1	Understand the fundamental concepts of digital image processing	PO1
2	Understand various 2D Image transformations	PO1, PO2
3	Understand image enhancement processing techniques and filters	PO4, PO6
4	Understand the classification of Image segmentation techniques	PO4, PO5, PO6
5	Understand various image compression techniques	PO3, PO8
Text Books		
1	S Jayaraman, S Esakkirajan, T Veerakumar, Digital image processing ,Tata McGraw Hill, 2015	
2	Gonzalez Rafel C, Digital Image Processing, Pearson Education, 2009	
Reference Books		
1.	Jain Anil K , Fundamentals of digital image processing: , PHI,1988	
2.	Kenneth R Castleman , Digital image processing:, Pearson Education,2/e,2003	
3.	Pratt William K , Digital Image Processing: , John Wiley,4/e,2007	
Web Resources		
1.	https://kanchiuniv.ac.in/coursematerials/Digital imageprocessing-VijayaRaghavan.pdf	
2.	http://sdeuoc.ac.in/sites/default/files/sde_videos/DigitalImageProcessing 3rd R.Gonzalez CR.Woods-ilovepdf-compressed.pdf	
3.	https://dl.acm.org/doi/10.5555/559707	
4.	https://www.ijert.org/image-processing-using-web-2-0-2	

Mapping with Programme Outcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
CC15	**PL/SQL Lab**	Core Lab		-	6	-	4		50	50	100

Course Objectives	
LO1	To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.
LO2	To understand 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 DML.
LO5	To understand the concepts of Cursor

Exercises

I. SQL

1. DDLCOMMANDS
2. DMLCOMMANDS
3. TCLCOMMANDS

II. PL/SQL

4. FIBONACCI SERIES
5. FACTORIAL
6. STRING REVERSE
7. SUM OF SERIES
8. TRIGGER

III. CURSOR

9. STUDENT MARK ANALYSIS USING CURSOR

IV. APPLICATION

10. LIBRARY MANAGEMENTSYSTEM
11. STUDENT MARK ANALYSIS

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	PO1, PO2

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

Mapping with Programme Outcomes:

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

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

ELECTIVE COURSES

FIRST YEAR

SEMESTER I

Subject Code	Subject Name	Category	L	T	P	Credits	Marks		
							CIA	External	Total
EC1	DISCRETE MATHEMATICS - I	Elective	4			3	25	75	100

COURSE OUTCOMES

On Successful completion of the course, the student will be able

CO1: To recall basic concepts for clear understanding of mathematical principles

CO2: To explain practical problems.

CO3: To construct matrices using discrete mathematics

CO4: To analyze techniques to draw graph using mathematics

CO5: To design graphs using the representations

Unit – I: RELATIONS

Introduction to Relations – Binary relation – Classification of Relations – Composition of Relations - Inverse of Relation – Closure operation on Relations – Matrix representation of Relation - digraphs.

Unit – II: FUNCTIONS

Introduction to Functions – Addition and Multiplication of Functions- Classifications of Functions – Composition of Function – Inverse Function.

Unit – III: MATHEMATICAL LOGIC

Introduction – Statement (Propositions) – Laws of Formal Logic –Basic Set of Logical operators/operations - Propositions and Truth Tables – Algebra Propositions - Tautologies and Contradictions – Logical Equivalence – Logical Implication – Normal Forms.

Unit – IV: MATRIX ALGEBRA

Introduction – Definition of a Matrix - Types of Matrices – Operations on Matrices – Related Matrices – Transpose of a Matrix – Symmetric and Skew-symmetric Matrices –Complex Matrix– Conjugate of a Matrix – Determinant of a Matrix – Typical Square Matrices – Adjoint and Inverse of a Matrix – Singular and Non-singular Matrices – Adjoint of a Square Matrix – Properties of Adjoint of a Matrix – Properties of Inverse of a Matrix.

Unit – V: GRAPH

Introduction – Graph and Basic Terminologies – Types of Graphs – Sub Graph and Isomorphic Graph – Operations on Graphs – Representation of Graph.

Text Book:
DISCRETE MATHEMATICS, Swapan Kumar Chakraborty and BikashKanti Sarkar, OXFORD University Press.
Reference Books: **1.** Discrete Mathematics, Third Edition, Seymour Lipschutz and Marc Lars Lipson, Tata McGraw Hill Education Private Limited. **2.** Discrete Mathematical Structures with Applications toComputer Science by J.P.Tremblay, R.Manohar TMH edition
Web Resource https://www.tutorialspoint.com › discrete_mathematics

Mapping with Programme Outcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	Credits	Marks		
							CIA	External	Total

EC1	**NUMERICALMETHODS**	Elective	4			3	25	75	100

COURSE OBJECTIVES:

Tointroducetheconceptofsolvingequationsusingdifferentmethods
TounderstandtheuseofAssignmentandTransportationproblems

COURSEOUTCOME:
Onsuccessfulcompletionofthecourse,thelearnerswillbeableto

1. Obtain numericalsolutionsofalgebraicand transcendentalequations
2. Solvesystemoflinearequationsnumericallyusingdirectanditerativemethods
3. Solveordinarydifferentialequations
4. ComputeintegrationusingSimpson's&TrapezoidalRule
5. Applynumericalmethodsinreallifeproblems

UnitI:
Curve Fitting: Introduction, Method of Least squares, Curve Fitting, Fitting a Straight Line

UnitII:
Solution of Algebraic and Transcendental Equations: Bisection method, Regula Falsi method, Newton Raphson Method

UnitIII:
Solution of Simultaneous Linear Equations: Solution of Simultaneous Linear Equations: Gauss Elimination method, Gauss-Jordan method, Gauss Seidel Method,Jacobi's method

UnitIV:
Numerical Differentiation & Integration: Differentiation: Using Newton's Forward Difference, Newton's Backward Difference, Newton's Divided Difference (First Order Differentiation only)
Integration:UsingTrapezoidalrule,Simpson's1/3&Simpson's3/8rules

UnitV:
SolutionofOrdinaryDifferentialEquations:Runge-Kutta2ndOrderand4thOrder methods,Predictor-CorrectorMethods:MilneandAdam'smethods.

Mapping with Programme Outcomes:

PO	PSO	COGNITIVE LEVEL

CO	1	2	3	4	5	1	2	3	4	5	
CO1	S	S	S	M	S	S	S	M	S	S	K– 2
CO2	S	S	M	S	S	S	S	S	S	S	K– 6
CO3	S	S	M	S	S	S	S	S	S	S	K– 4
CO4	S	S	M	S	S	S	S	S	S	S	K– 6
CO5	S	S	M	S	S	S	S	S	S	S	K– 6

StronglyCorrelated–S,ModeratelyCorrelated–M,WeeklyCorrelated-L

SEMESTER II

EC2	DIGITAL LOGIC FUNDAMENTALS

Course Objective:

- To familiarize the student with basic principles and fundamentals in digital logics and design.
- To develop basic skills using tools and theory used in design process.
- To understand the creative process, develop techniques and methods of creative problem solving.

Course outcomes:

Upon completion of the course, the students will be able to

- Know the definition of digital logics and circuits(K1)
- Understand the digital devices (K2)
- Understand the digital arithmetic circuits(K2)
- Acquire Knowledge on basics of Gates and its Applications(K4)
- Have the necessary understanding on Registers for Counting Applications (K4)

Unit I :

Digital System and binary numbers:

Digital systems – binary numbers – number base conversion – Octal and hexadecimal numbers – complements – signed binary numbers – binary codes – binary storage and registers – binary logic.

Boolean algebra:

Introduction – basic definition – axiomatic definition of Boolean algebra – basic theorem and properties and of Boolean algebra – Boolean functions.

Unit II :

Logic gates:

Canonical and standard forms – other logic operations – digital logic gates and integrated circuits.

Gate-Level minimization:

Introduction : The Map method – Four- variable Maps –Five-variable Map – Product –of-sums simplifications- Don‘t conditions.

Unit III :

NAND and NOR implementation- other two level implementations – Exclusive OR Functions.

Combinational Logic: Introduction – Combinational circuits – Analysis Procedure - Design Procedure

– Binary Adder – Subtractor – Decimal Adder - Binary Multiplier - Magnitude Comparator.

Unit IV :

Combinational Logic: Decoders - Encoders – Multiplexers.

Synchronous Sequential Logic:

Introduction –Sequential Circuits – Storage Element Latches - Storage Element Flip- Flops - Analysis of Clocked Sequential Circuits.

Unit V : **Registers and Counters**: Registers – Shift Registers – Ripple Counters – Synchronous Counters – Other Counters. **Memory :**Introduction – Random access memory –MemoryDecoding –ErrorDetectionand Correction – Read Only Memory.
Text Book
Digital Design - Fourth Edition – M.Morris Mano, Michael D Ciletti,- Prentice Hall of India Pvt Ltd., 2007
Reference Books
1.Digital Principles and Applications – Albert Paul Malvino, Donald P Leach, Tata McGraw-Hill Publishing Company Ltd. 2.Digital Principles and Design – Donald D.Givone, Tata McGraw-Hill Publishing Company Limited

Mapping of COs to POs and PSOs

Course Outcome	PO Addressed PO1 to PO7	Correlation Level L/M/H	PSO Addressed PSO1 to PSO7	Correlation Level L/ M/ H	Cognitive Level K1 to K6
CO1	PO3	H	PSO1	H	K1
CO2	PO3, PO6	H/M	PSO2, PSO6	H/M	K2
CO3	PO1, PO2, PO5	H/M/M	PSO4	M	K3
CO4	PO1, PO5	H/M	PSO4,PSO5	H/M	K4
CO5	PO3, PO4	H/M	PSO4	H	K5

(L – Low, M – Medium, H – High; K1 – Understand, K2 – Apply, K3 – Analyze, K4 – Evaluate, K5 Create)

EC2 OPTIMIZATION TECHNIQUES
Course objectives: 1.To apply various optimization techniques for decision making. 2.To introduce the use of variables for formulating complex mathematical models in management, science and industrial applications.
UNITI **INTRODUCTION OPERATIONS RESEARCH** TheNatureandMeaningofOR–Management–ApplicationsofOR– ModelinginOR–Generalmethodsfor solving OR models– Scope of OR – Advantages and disadvantages of OR
UNIT II **LINEAR PROGRAMMING PROBLEM** LinearProgramming Problem:FormulationofLPproblems– GraphicalsolutionofLPproblems– GeneralformulationofLPP–Slack andSurplusvariables–StandardformofLPP
UNITIII **ASSIGNMENTPROBLEMS** AssignmentProblem:Mathematicalformulation–Hungarianmethod–Unbalancedassignmentproblem–Varioustypes
UNITIV **TRANSPORTATIONPROBLEMS** Transportation Model: Mathematical formulation – Matrix form–Methods forfinding Initial Basic Feasible solution and Optimal solution.
UNITV **PERTANDCPMTECHNIQUES** PERTandCPMTechniques:BasicSteps–NetworkDiagramrepresentation– RulesfordrawingNetworkDiagram– LabelingFulkerson'sI–JRule– TimeEstimatesandCriticalPathinNetworkAnalysis – Examples on optimum duration and minimum duration cost –PERT.
CourseOutcomes On successful completionofthecourse,thelearnerswillbeableto CO1.Formulateandsolve LinearProgrammingProblems. CO2.AnalyzetheusageofAssignmentProblems. CO3.EvaluateTransportationModels. CO4.ApplyPERTandCPMtechniquestofindtheoptimalsolution.
TEXTBOOK
1.S.D.Sharma,"OperationsResearch",TenthEdition,Pearson,2017.
REFERENCEBOOKS
1. HamdyATaha,"OperationsResearch"NinthEdition,Pearson, 2016. 2.V.Sundaresan,K.S.GanapathySubramanian,K. Ganesan,"ResourceManagementTechniques", NinthEdition,A.R.Publications,2015

CO-PO–PSO Mapping

OPTIMIZATIONTECHNIQUES											
CO	PO					PSO					COGNITIVE LEVEL
	1	2	3	4	5	1	2	3	4	5	
CO1	S	S	S	M	S	S	S	M	S	S	K-2
CO2	S	S	M	S	S	S	S	S	S	S	K-1
CO3	S	S	M	S	S	S	S	S	S	S	K-3
CO4	S	S	M	S	S	S	S	S	S	S	K-5
CO5	S	S	M	S	S	S	S	S	S	S	K–6

StronglyCorrelated–S,ModeratelyCorrelated–M,WeeklyCorrelated-L

SECOND YEAR
SEMESTER III

Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks		
								CIA	External	Total
EC3	**Microprocessor and Microcontroller**	Elective	3			3		25	75	100

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

UNIT	Details	No. of Hours	CO
I	Digital Computers - Microcomputer Organization-Computer languages – Microprocessor Architecture and its operations – Microprocessor initiated operations and 8085 Bus organization – Internal Data operations and 8085 registers - Peripheral or External initiated operations.	10	C1
II	8085 Microprocessor – Pinout and Signals – Functional block diagram - 8085 Instruction Set and Classifications.	10	C2
III	BCD to Binary and Binary to BCD conversions - ASCII to BCD and BCD to ASCII conversions - Binary to ASCII and ASCII to Binary conversions. BCD Arithmetic - BCD addition and Subtraction - Multibyte Addition and Subtraction - Multiplication and Division.	10	C3
IV	The 8085 Interrupts – RIM AND SIM instructions-8259 Programmable Interrupt Controller-Direct Memory Access (DMA) and 8257 DMA controller.	10	C4
V	Introduction to Microcontroller - Microcontroller Vs Microprocessor -	10	C6

	8051 Microcontroller architecture - 8051 pin description. Timers and Counters – Operating Modes- Control Registers. Interrupts – Interrupts in 8051 - Interrupts Control Register – Execution of interrupt.		
	Total	**50**	

Course Outcomes		**Programmeme Outcomes**
CO	On completion of this course, students will	
1	Remember the Basic binary codes and their conversions. Binary concepts are used in Microprocessor programming and provide a good understanding of the architecture of 8085.	PO1
2	Understanding the 8085 instruction set and their classifications, enables the students to write the programs easily on their own using different logic.	PO1,PO2
3	Apply different types of instructions to convert binary codes and analyzing the outcome. The instruction set is applied to develop programs on multibyte arithmetic operations.	PO4,PO6
4	Analyze how peripheral devices are connected to 8085 using Interrupts and DMA controller.	PO4,PO5,PO6
5	Have an exposure to create real time applications using microcontroller.	PO3,PO8

Text Books	
1	R. S. Gaonkar- "Microprocessor Architecture- Programming and Applications with 8085", 5th Edition- Penram International Publications,2009. [For unit I to unit IV]
2	Soumitra Kumar Mandal -"Microprocessors and Microcontrollers – Architectures, Programming and Interfacing using 8085, 8086, 8051", Tata McGraw Hill Education Private Limited. [for unit V].
Reference Books	
1.	Mathur- "Introduction to Microprocessor"- 3rd Edition- Tata McGraw-Hill -1993.
2.	Raj Kamal - "Microcontrollers: Architecture, Programming, Interfacing and System Design", Pearson Education, 2005.

3.	Krishna Kant, "Microprocessors and Microcontrollers – Architectures, Programming and System Design 8085, 8086, 8051, 8096", PHI, 2008
Web Resources	
1.	Web resources from NDL Library, E-content from open source libraries
2.	https://www.bing.com/

Mapping with Programme Outcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks		
								CIA	External	Total
EC3	**Cyber Forensics**	Elective	3			3		25	75	100

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

UNIT	Details	No. of Hours	Course Objective
I	**Overview of Computer Forensics Technology:** Computer Forensics Fundamentals: What is Computer Forensics Use of ComputerForensics in Law Enforcement, Computer Forensics Assistance to HumanResources/Employment Proceedings, Computer Forensics Services, Benefits of professionalForensics Methodology, Steps taken by Computer Forensics Specialists. Types of ComputerForensics Technology: Types of Business Computer Forensic, Technology–Types ofMilitary Computer Forensic Technology–Types of Law Enforcement–Computer Forensic. Technology–Types of Business Computer Forensic Technology.	10	C1
II	**Computer Forensics Evidence and capture:** Data Recovery: Data Recovery Defined, Data Back–up and Recovery, The Role of Back –up in Data Recovery, The Data –Recovery Solution. Evidence Collection and Data Seizure: Collection Options, Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence, General Procedure, Collection and Archiving, Methods of Collections, Artefacts, Collection Steps, Controlling Contamination: The chain of custody.	10	C2

III	**Duplication and Preservation of Digital Evidence:** Processing steps, Legal Aspects of collecting and Preserving Computerforensic Evidence. Computer image Verification and Authentication: Special needs of Evidential Authentication, Practical Consideration, Practical Implementation.	10	C3
IV	**Computer Forensics Analysis:** Discovery of Electronic Evidence: ElectronicDocument Discovery: A Powerful New Litigation Tool. Identification of Data: Time Travel, Forensic Identification and Analysis of Technical Surveillance Devices.	10	C4
V	**Reconstructing Past Events:** How to Become a Digital Detective, Useable File Formats,Unusable File Formats, Converting Files.Networks: Network Forensics Scenario, a technical approach, Destruction Of E–Mail, Damaging Computer Evidence, DocumentingThe Intrusion on Destruction of Data, System Testing.	10	C5
	Total	**50**	

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
1	Understand the definition of computer forensics fundamentals.	PO1
2	Evaluate the different types of computer forensics technology.	PO1, PO2
3	Analyze various computer forensics systems.	PO4, PO6
4	Apply the methods for data recovery, evidence collection and data seizure.	PO4, PO5, PO6
5	Gain the knowledge of duplication and preservation of digital evidence.	PO3, PO8

Text Book

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

Reference Books

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

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

Mapping with Programme Outcomes:

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

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

SEMESTER IV

EC4FINANCIALACCOUNTING
Course Objectives • Toimpart basicaccountingknowledge. • Toprovideknowledgeonthefundamentalsoffinancial accounting. • Toexposethestudenttovariousfinancialtransactionsanditscurrentapplications.
UNIT-1BASICCONCEPTSOFACCOUNTING Introduction to Accounting : Need for Accounting –Accounting as the language of business– AttributesandstepsofAccounting–BookkeepingVsAccounting–BranchesofAccounting– MethodsofAccounting – Types of Accounting – Accounting Rules - Bases of Accounting – Accounting terminology.BasicAccountingConcepts:MeaningandclassificationofAccounting-AccountingConcepts–AccountingConversion –Accountingequations.
UNIT–2JOURNALANDLEDGER Recording a Financial Data: Memorandum Book, business transaction, Journal, Rules for Debit and Credit,Compound Journal entry, Advantages of Journal, Ledger, Ledger Account, Ledger Posting, Process ofPosting,BalancingofAnAccount,SignificanceofBalances,RelationbetweenJournalandLedger-SubsidiaryBooks.
UNIT–3PREPARINGTRIALBALANCE Trail Balance: Objects, Methods of Preparing Trail Balance, how to locate errors, hints for the preparation of trail balance & problems.
UNIT-4FINALACCOUNTS Trading account - individual items posted to the debit of trading account - individual items credited to trading account – advantages of trading account – profit & loss account – advantages of profit & loss account – manufacturing account – balance sheet – classification of assets & liabilities
UNIT–5 ACCOUNTSFORNONPROFITORGANISATION Introduction – Final accounts of no trading concern – receipts and payments account – features – income & expenditure account - feature - distinction between the two – treatment of special items – some important adjustments – types of problems – Distinction between income and expenditure account and profit and loss account – accounts of professional men.
COURSEOUTCOMES: Uponcompletionofthecourse,thestudentsshouldbeable: • Toacquireknowledgeaboutgeneralaspectsofbusinessoperations. • To explain the concepts and procedures of financial reporting, including income andexpenditurestatement, balance sheetetc.

- Tolocateandanalyzefinancial datafromannual reportsofcorporations.

TextBooks

1. FinancialAccounting-T.S.Reddy,A.Murthy–MarghamPublications,2012.
2. Fundamentals of Advanced Accounting - R.S.N.Pillai, Bagavathi, S.Uma, 5th Edition,S.ChandPublication,2012.

ReferenceBooks

1. EssentialsofFinancialAccounting–AsishK.Bhattacharayya,PHI,2020.
2. AdvancedAccountancy -S.P.JainandNarang–KalyaniPublications,2017.

Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks		
								CIA	External	Total
EC4	**Cloud Computing**	Elective	3			3		25	75	100
Course Objectives										
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.									10
II	Cloud Services Compute Services: Amazon Elastic Computer Cloud - Google Compute Engine - Windows Azure Virtual Machines Storage Services: Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage Database Services: Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database - Windows Azure Table Service Application Services: Application Runtimes and Frameworks - Queuing Services - Email Services - Notification Services - Media Services Content Delivery Services: Amazon CloudFront - Windows Azure Content Delivery Network									10

	Analytics Services: Amazon Elastic MapReduce - Google MapReduce Service - Google Big Query - Windows Azure HDInsight Deployment and Management Services: Amazon Elastic Bean stack - Amazon CloudFormation Identity and Access Management Services: Amazon Identity and Access Management - Windows Azure Active Directory Open Source Private Cloud Software: Cloud Stack – Eucalyptus - OpenStack	
III	**Cloud Application Design:** Introduction – Design Considération for Cloud Applications – Scalability – Reliability and Availability – Security – Maintenance and Upgradation – Performance – Reference Architectures for Cloud Applications – Cloud Application Design Méthodologies: Service Oriented Architecture (SOA), Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller (MVC), RESTful Web Services – Data Storage Approaches: RelationalApproach (SQL), Non-RelationalApproach (NoSQL).	10
IV	**Cloud Application Benchmarking and Tuning:**Introduction to Benchmarking – Steps in Benchmarking – WorkloadCharacteristics – Application Performance Metrics – Design Consideration for Benchmarking Methodology – Benchmarking Tools and Types of Tests – DeploymentPrototyping. **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.	10
V	**Case Studies:**Cloud Computing for Healthcare – Cloud Computing for Energy Systems - Cloud Computing for Transportation Systems - Cloud Computing for ManufacturingIndustry - Cloud Computing for Education.	10
	Total	**50**

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 CloudComputing.	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

THIRD YEAR
SEMESTER V

SOFTWARE PROJECT MANAGEMENT

Subject Code	L	T	P	Credits	Inst. Hours	Marks		
						CIA	External	Total
EC5	4	-	-	3	-	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	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
Textbook	
	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	Credits	Inst. Hours	Marks		
								CIA	External	Total
EC5	**Agile Project Management**	Elective	4	-	-	3		25	75	100
Course Objectives										
LO1	Learning of software design, software technologies and APIs.									
LO2	Detailed demonstration about Agile development and testing techniques.									
LO3	Learning about Agile Planning and Execution.									
LO4	Learning of Agile Management Design and Quality Check.									
LO5	Detailed examination of Agile development and testing techniques.									
UNIT	**Details**									**No. of Hours**
I	**Introduction:Modernizing Project Management:** Project Management Needed a Makeover – Introducing Agile Project Management. **Applying the Agile Manifesto and Principles:** Understanding the Agile manifesto – Outlining the four values of the Agile manifesto – Defining the 15 Agile Principles – Adding the Platinum Principles – Changes as a result of Agile Values – The Agile litmus test. **Why Being Agile Works Better:** Evaluating Agile benefits – How Agile approaches beat historical approaches – Why people like being Agile.									12
II	**Being Agile** **Agile Approaches:** Diving under the umbrella of Agile approaches –									12

	Reviewing the Big Three: Lean, Scrum, Extreme Programming - Summary **Agile Environments in Action:** Creating the physical environment – Low-tech communicating – High-tech communicating – Choosing tools. **Agile Behaviours in Action:** Establishing Agile roles – Establishing new values – Changing team philosophy.	
III	**Agile Planning and Execution** **Defining the Product Vision and Roadmap:** Agile planning – Defining the product vision – Creating a product roadmap – Completing the product backlog. **Planning Releases and Sprints:** Refining requirements and estimates – Release planning – Sprint planning. **Working Throughout the Day:** Planning your day – Tracking progress – Agile roles in the sprint – Creating shippable functionality – The end of the day. **Showcasing Work, Inspecting and Adapting:** The sprint review – The sprint retrospective. **Preparing for Release:** Preparing the product for deployment (the release sprint) – Preparing the operational support – Preparing the organization for product deployment - Preparing the marketplace for product deployment	12
IV	**Agile Management** **Managing Scope and Procurement:** What's different about Agile scope management – Managing Agile scope – What's different about Agile procurement – Managing Agile procurement. **Managing Time and Cost:** What's different about Agile time management – Managing Agile schedules – What's different about	12

	Agile cost management – Managing Agile budgets. **Managing Team Dynamics and Communication:** What's different about Agile team dynamics – Managing Agile team dynamics – What's different about Agile communication – Managing Agile communication. **Managing Quality and Risk:** What'sdifferent about Agile quality – Managing Agile quality – What's different about Agile risk management – Managing Agile risk.	
V	**Implementing Agile** **Building a Foundation:** Organizational and individual commitment – Choosing the right pilot team members – Creating and environment that enables Agility – Support Agility initially and over time. **Being a Change Agent:** Becoming Agile requires change – why change doesn't happen on its own – Platinum Edge's Change Roadmap – Avoiding pitfalls – Signs your changes are slipping. **Benefits, Factors for Success and Metrics:** Ten key benefits of Agile project management – Ten key factors for project success – Ten metrics for Agile Organizations.	12
	Total	**60**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
1	Understand the of software design, software technologies and APIs using Agile Management.	PO1
2	Understand Agile development and testing techniques.	PO1, PO2
3	Understand about Agile Planning and Execution using Sprint.	PO4, PO6
4	UnderstandAgile Management Design, scope , Procurement, managing Time and Cost and Quality	PO4, PO5, PO6

	Check.	
5	Analyse Agile development and testing techniques,	PO3, PO8
Text Books		
1	Mark C. Layton, Steven J. Ostermiller, Agile Project Management for Dummies, 2nd Edition, Wiley India Pvt. Ltd., 2018.	
2	Jeff Sutherland, Scrum – The Art of Doing Twice the Work in Half the Time, Penguin, 2014.	
Reference Books		
1.	Mark C. Layton, David Morrow, Scrum for Dummies, 2nd Edition, Wiley India Pvt. Ltd., 2018.	
2.	Mike Cohn, Succeeding with Agile – Software Development using Scrum, Addison-Wesley Signature Series, 2010.	
3.	Alex Moore, Agile Project Management, 2020.	
4.	Alex Moore, Scrum, 2020.	
5.	Andrew Stellman and Jennifer Greene, Learning Agile: Understanding Scrum, XP, Lean, and Kanban, Shroff/O'Reilly, First Edition, 2014.	
Web Resources		
1.	www.agilealliance.org/resources	

Mapping with Programme Outcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks		
								CIA	External	Total
EC6	**Artificial Intelligence**	Elective	4	-	-	3	-	25	75	100
Course Objectives										
LO1	To learn various concepts of AI Techniques.									
LO2	To learn various Search Algorithm in AI.									
LO3	To learn probabilistic reasoning and models in AI.									
LO4	To learn about Markov Decision Process.									
LO5	To learn various types of Reinforcement learning.									
UNIT	**Details**									**No. of Hours**
I	Introduction: Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree									12
II	Search Algorithms : Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search, A* algorithm, Game Search									12
III	Probabilistic Reasoning : Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference, temporal model, hidden Markov model									12
IV	Markov Decision process : MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable MDPs.									12
V	Reinforcement Learning : Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning									12
	Total									**60**

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

Mapping with Programme Outcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	Credits	Marks		
							CIA	External	Total
EC6	MACHINE LEARNING		4			3	25	75	100

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

UNIT	Contents	No. Of. Hours
I	**Introduction Machine Learning** - Difference between AI, Machine Learning and Big data. Supervised and unsupervised learning, parametric vs non-parametric models, parametric models for classification and regression- Linear Regression, Logistic Regression, Naïve Bayes classifier, simple non-parametric classifier-K-nearest neighbour, support vector machines	**12**
II	**Neural networks and genetic algorithms** Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.	**12**
III	**Bayesian and computational learning** Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.	**12**
IV	**Instant based learning** K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.	**12**
V	**Advanced learning** Recommendation systems – opinion mining, sentiment analysis. Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning.	**12**
Total		**60**

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Appreciate the importance of visualization in the data analytics solution	PO1, PO2, PO3, PO4, PO5, PO6

CO2	Apply structured thinking to unstructured problems	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Understand a very broad collection of machine learning algorithms and problems	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Learn algorithmic topics of machine learning and mathematically deep enough to introduce the required theory	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Develop an appreciation for what is involved in learning from data.	PO1, PO2, PO3, PO4, PO5, PO6
Textbooks		
1	Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.	
2	Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning" 2015, MIT Press	
Reference Books		
1.	EthemAlpaydin, ―Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.	
2	Stephen Marsland, ―Machine Learning: An Algorithmic Perspective, CRC Press, 2009.	

Mapping with Programme Outcomes:

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

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

SEMESTER VI

Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks		
								CIA	External	Total
EC7	**ROBOTICSand ITS APPLICATIONS**	Elective	5	-	-	-	3	25	75	100

Course Objective	
LO1	To understandtheroboticsfundamentals.
LO2	To understandthesensorsandmatrixmethods
LO3	To understandtheProgramming language ROS
LO4	Tostudyabouttheapplications of robotics
LO5	Tolearnaboutthefuture trends of robotics

UNIT	**Details**	**No. of Hours**
I	**Introduction to Robotics** Definition and history of robotics - Types of robots (industrial, mobile, service, etc.) - Key components of a robot: sensors, actuators, controllers - Overview of applications in various industries	15
II	**Robotic Hardware** Actuators: electric motors, servos, and pneumatic systems - Sensors: types and applications (proximity, vision, tactile, etc.) - Microcontrollers and processors in robotics - Design and construction of robotic systems	15
III	**Robot Programming** Programming languages for robotics: Python, C++, ROS (Robot Operating System) - Basics of ROS: nodes, topics, services - Writing and executing basic robot programs - Simulation tools: Gazebo, V-REP	15
IV	**Applications of Robotics** Industrial automation and manufacturing- Robotics in healthcare: surgery, rehabilitation, assistive robots - Service robotics: domestic robots, logistics, customer service - Robotics in entertainment: animatronics, gaming, VR	15

V	**Ethics and Future Trends** Ethical considerations in robotics - Legal and societal implications - Future trends: AI in robotics, collaborative robots (cobots), swarm robotics - Case studies of emerging robotic technologies	15
	Total	**75**

Course Outcomes		**Programme Outcome**
CO	On completion of this course, students will	
1	Understand the basics of Robotics	PO1
2	Know about the robotics hardware	PO1, PO2
3	Develop the basic robot programs	PO4, PO6
4	Learn the areas where the robotics can be used	PO4, PO5, PO6
5	Know the future trends of the robotics	PO3, PO8

Text Books	
1	Introduction to Robotics: Mechanics and Control, John J. Craig
2	Robotics: Modelling, Planning and Control, Bruno Siciliano, Lorenzo Sciavicco, Luigi Villani, and Giuseppe Oriolo
3	Robot Programming: A Guide to Controlling Autonomous Robots, Cameron Hughes and Tracey Hughes
Reference Books	
1.	Learning ROSfor Robotics Programming, Enrique Fernandez, Aaron Martinez, and Luis Sanchez
2	Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig
Web Resources	
1.	https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_robotics.m
2.	https://www.geeksforgeeks.org/robotics-introduction/

MappingwithProgrammeOutcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks		
								CIA	External	Total
EC7	**Computer Networks**	Elective	5			3		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	Understand the basics of Computer Network architecture, OSI and TCP/IP reference model	PO1
2	Gain knowledge on Telephone systems using wireless network	PO1, PO2
3	Understand the concept of MAC	PO4, PO6
4	Analyze the characteristics of Routing and	PO4, PO5, PO6

	Congestion control algorithms	
5	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 OpenSystems", 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
	INTRODUCTION TO DATA SCIENCE		5	-	-	-	3		25	75	100

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

UNIT	**Details**	**No. of Hours**
I	**Introduction:** Benefits and uses – Facts of data – Data science process – Big data ecosystem and data science	15
II	**The Data science process**:Overview – research goals - retrieving data - transformation – Exploratory Data Analysis – Model building	15
III	**Algorithms** :Machine learning algorithms – Modeling process – Types – Supervised – Unsupervised - Semi-supervised	15
IV	**Introduction to Hadoop** :Hadoop framework – Spark – replacing MapReduce– NoSQL – ACID – CAP – BASE – types	15
V	**Case Study**: Prediction of Disease - Setting research goals - Data retrieval – preparation - exploration - Disease profiling - presentation and automation	15
	Total	**75**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
1	Understand the basics in Data Science and Big data.	PO1
2	Understand overview and building process in Data Science.	PO1, PO2

3	Understand various Algorithms in Data Science.	PO4, PO6
4	Understand Hadoop Framework in Data Science.	PO4, PO5, PO6
5	Case study in Data Science.	PO3, PO8
Text Book		
1	Davy Cielen, Arno D. B. Meysman, Mohamed Ali, "Introducing Data Science", manning publications 2016	
Reference Books		
1.	Roger Peng, "The Art of Data Science", lulu.com 2016.	
2.	MurtazaHaider, "Getting Started with Data Science – Making Sense of Data with Analytics", IBM press, E-book.	
3.	Davy Cielen, Arno D.B. Meysman, Mohamed Ali,"Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools", Dreamtech Press 2016.	
4.	Annalyn Ng, Kenneth Soo, "Numsense! Data Science for the Layman: No Math Added", 2017,1st Edition.	
5.	Cathy O'Neil, Rachel Schutt, "Doing Data Science Straight Talk from the Frontline", O'Reilly Media 2013.	
6.	Lillian Pierson, "Data Science for Dummies", 2017 II Edition	
Web Resources		
1.	https://www.w3schools.com/datascience/	
2.	https://en.wikipedia.org/wiki/Data_science	
3.	http://www.cmap.polytechnique.fr/~lepennec/en/post/references/refs/	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	**3**	**2**	**`1**	**2**	**2**	**-**
CO 2	**2**	**3**	**2**	**2**	**-**	**1**
CO 3	**3**	**2**	**2**	**1**	**1**	**3**
CO 4	**1**	**2**	**2**	**1**	**3**	**1**
CO 5	**2**	**2**	**-**	**3**	**1**	**1**
Weightage of course contributed to each PSO	11	11	7	9	7	6

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

Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks		
								CIA	External	Total
EC8	**DataMining andWarehousing**		5	-	-	3		25	75	100
Course Objectives										
LO1	To provide the knowledge on Data Mining and Warehousing concepts and techniques									
LO2	To study the basic concepts of Data Mining, Architecture and Comparison.									
LO3	To study a set of Mining Association Rules, Data Warehouses.									
LO4	To study about Classification and Prediction, Classifier Accuracy									
LO5	To study the basic concepts of cluster analysis, Cluster Methods									

UNIT	Details	No. of Hours	Course Objectives
I	Introduction: Data mining – Functionalities – Classification – Introduction to Data Warehousing – Data Preprocessing: Preprocessing the Data – Data cleaning – Data Integration and Transformation – Data Reduction	15	CO1
II	Data Mining, Primitives, Languages and System Architecture: Data Mining – Primitives – Data Mining Query Language, Architecture of Data mining Systems. Concept Description, Characterization and Comparison: Concept Description, Data Generalization and Summarization, Analytical Characterization, Mining Class Comparison – Statistical Measures.	15	CO2
III	Mining Association Rules: Basic Concepts – Single Dimensional Boolean Association Rules From Transaction Databases, Multilevel Association Rules from transaction databases – Multi dimension Association Rules from Relational Database and Data Warehouses.	15	CO3
IV	Classification and Prediction: Introduction – Issues – Decision Tree Induction – Bayesian Classification –	15	CO4

	Classification of Back Propagation. Classification based on Concepts from Association Rule Mining – Other Methods. Prediction – Introduction – Classifier Accuracy		
V	Cluster Analysis: Introduction – Types of Data in Cluster Analysis, Petitioning Methods – Hierarchical Methods-Density Based Methods – GRID Based Method – Model based Clustering Method	15	CO5
	Total	**75**	

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

Text Books (Latest Editions)	
1.	Han and M. Kamber, "Data Mining Concepts and Techniques", 2001, Harcourt India Pvt. Ltd, New Delhi.
References Books (Latest editions)	
1.	K.P. Soman, ShyamDiwakar, V. Ajay "Insight into Data Mining Theory and Practice ",Prentice Hall of India Pvt. Ltd, New Delhi
2.	Parteek Bhatia, 'Data Mining and Data Warehousing: Principles and Practical Techniques', Cambridge University Press, 2019
Web Resources	
1.	https://www.topcoder.com/thrive/articles/data-warehousing-and-data-mining#:~:text=Data%20warehousing%20is%20a%20method,compiled%20in%20the%20data%20warehouse.
2.	https://www.javatpoint.com/data-mining-cluster-vs-data-warehousing
3.	https://www.tutorialspoint.com/Data-Warehousing-and-Data-Mining

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	2	3	2	2
CO 3	2	2	-	3	-	3
CO 4	3	3	2	3	1	1
CO 5	1	3	3	3	3	2
Weightage of course contributed to each PSO	12	14	10	15	9	11

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

SKILL ENHANCEMENT COURSES

FIRST YEAR
SEMESTER I

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
SEC1	**Office Automation Lab**	Skill EC			2		2		50	50	100

Course Objectives	
C1	Understand the basics of computer systems and its components.
C2	Understand and apply the basic concepts of a word processing package.
C3	Understand and apply the basic concepts of electronic spreadsheet software.
C4	Understand and create a presentation using PowerPoint tool.
C5	Understand and apply the basic concepts of database management system.

Exercises

MS – Word

1. Prepare a word document for Spell checking and Thesaurus.
2. Find a word and Replace with another in a document.
3. Insert Header with College Name, Footer with Page No., and Footnote in a document.
4. Insert mathematical symbols using Microsoft equation 3.0.
5. Preparing Newspaper format (Apply Alignment, Font, Property, Line spacing,Picture Format).
6. Prepare a Bio-Data and insert the contents of qualification within the table.
7. Mail Merge

MS – Excel

1. Apply formulas and functions.
2. Prepare a chart for population growth.
3. Apply ascending and descending order.
4. Apply auto format.

MS – PowerPoint

1. Create a power point presentation with 3 slides.
2. Create a design template with 3 slides.
3. Create a presentation with animation.
4. Create a power point presentation with 4 slides. Set slide transition time of 3seconds and display your presentation.

MS – Access

1.Create an employee database.
2.Create a mark statement for a class of 20 students. Find total, average and rank the marks. Give proper headings.
3.Create a report.

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

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	M	S	M			M		L
CO 2	S	M	S			M		
CO 3		S	S		M		L	
CO 4			S	L	M		M	
CO 5				M		S	M	S

S-Strong M-Medium L-Low

SEMESTER II

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.	Marks		
									CIA	External	Total
SEC2	**WEBDESIGNING**	Skill EC	2	-	-	-	1		25	75	100

CourseObjectives	
LO1	Understandthebasicsof HTMLanditscomponents
LO2	TostudyabouttheGraphicsinHTML
LO3	Understandandapplytheconceptsof XMLandDHTML
LO4	UnderstandtheconceptofJavaScript
LO5	Toidentifyandunderstandthe goalsandobjectivesoftheAjax

UNIT	**Details**	**No.ofHours**
I	HTML:HTML-Introduction-tagbasics-page structure-addingcommentsworkingwithtexts,paragraphs and line break. Emphasizing test- headingand horizontal rules-list-font size,faceandcolor-Alignmentlinks-tables-frames.	6
II	Forms&ImagesUsingHtml:Graphics:Introduction-How to work efficiently with images inwebpages,imagemaps,GIFanimation,addingmultimedia, data collection with html forms textbox,password,listbox,combobox,textarea,toolsfor Buildingwebpagefrontpage.	6
III	XML & DHTML: Cascading style sheet (CSS)-whatis CSS-Why we use CSS-adding CSS to your webpages-Groupingstyles-extensiblemarkuplanguage(XML).	6

IV	Dynamic HTML: Document object model (DCOM)-Accessing HTML & CSS through DCOM Dynamiccontentstyles&positioning-Eventbubbling-databinding. JavaScript: Client-side scripting, What is JavaScript,HowtodevelopJavaScript,simpleJavaScript,variables,functions,conditions,loopsandrepetition,	6

V	Advancescript,JavaScriptandobjects,JavaScriptownobjects,theDOMandwebbrowserenvironments,formsandvalidations.	6
	Total	**30**

CourseOutcomes		**ProgrammeOutcomes**
CO	Oncompletionofthiscourse,studentswill	
1	DevelopworkingknowledgeofHTML	PO1, PO3,PO6, PO8
2	Learn to developWebpagesusingHypertextMarkupLanguage(HTML).	PO1,PO2,PO3,PO6
3	Have the abilitytooptimizepagestylesandlayoutwithCascadingStyleSheets(CSS).	PO3,PO5
4	Developajavascript	PO1,PO2,PO3, PO7
5	Get knowledge todevelopwebapplications	P02,PO6,PO7

TextBooks	
1	PankajSharma,–WebTechnology,SkKataria&SonsBangalore2011.
2	MikeMcgrath,–JavaScript‖,DreamTechPress2006,1st Edition.
3	AchyutSGodbole&AtulKahate,–WebTechnologies‖,2002,2nd Edition.

ReferenceBooks	
1.	LauraLemay,RafeColburn,JenniferKyrnin,–MasteringHTML,CSS&JavaScriptWeb Publishing‖,2016.
2.	DTEditorialServices(Author),–HTML5BlackBook(CoversCSS3,JavaScript,XML,HTML,AJAX, PHP,jQuery)‖,Paperback2016,2ndEdition.

WebResources	
1.	NPTEL&MOOCcoursestitledWebDesignandDevelopment.
2.	https://www.geeksforgeeks.org

MappingwithProgrammeOutcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	Credits	Marks		
							CIA	External	Total
SEC3	**HTML LAB**	Skill EC	-	-	2	1	50	50	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.

	Excercises	**No. of. Hours**
	1. Create a website using internal links and images. 2. Design a calendar using table tag. 3. Create a HTML document to display a list of five flowers and link each one to another document displaying brief description of the flower, Add pictures wherever possible. 4. Write a HTML code to display a list of 5 cars in a frame, link each one to a brief description in second frame. The left frame should display the list and the right frame should display the paragraph about the frame. 5. Create a simple HTML Form covering major form elements. 6. Embed Audio and Video in a HTML page. 7. Rotate an element using CSS. 8. Build a simple quiz.	
	Total	**30**

Course Outcomes		**Programme Outcomes**
CO	On completion of this course, students will	
CO1	Know the basic concept in HTML. Concept of resources in HTML.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	KnowDesign concept, Concept of Forms. Understand the concept of save the files.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Understand the page formatting. Concept of CSS.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Creating Links. Know the concept of embedding audio and video in a page.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Understand the table creation.	PO1, PO2, PO3, PO4, PO5, PO6

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

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

Mapping with Programme Outcomes:

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

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

SECOND YEAR
SEMESTER III

Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks		
								CIA	External	Total
SEC4	**PHP PROGRAMMING LAB**	Skill EC			2	2		50	50	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.									
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 sessions and cookies.									
	Exercises									
	1. Get name of a user from a form and show greeting text. 2. Write a PHP program to check whether given string is palindrome or not. 3. Write a PHP program to check whether given number is Armstrong or not. 4. Write a PHP program using function. 5. Create a PHP page for login page without sql connection. 6. Write a PHP program for Array manipulation. 7. Write a PHP program to design personal information 8. Create a PHP page for login page with sql connection. 9Create a web page to advertise a product of the company using images and audio. 10. Create a PHP page for login system using session.									

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

SEMESTER IV

Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks		
								CIA	External	Total
SEC5	**Multimedia SystemsLab**	Elective	-	-	2	2		50	50	100

Course Objective	
LO1	Understand the definition of Multimedia
LO2	To study about the Image File Formats, Sounds&Audio File Formats
LO3	Understand the concepts of Animation
LO4	To study about the cropping techniques
LO5	Understand the concept of various colour effects
	Exercises (any tool can be used)
	1. Create an animation to represent the growing moon. 2. Design and make a ball bouncing on steps. 3.Simulate the movement of a cloud showing the color effects. 4. Prepare a cover page for the book of your subject area. 5. Design a visiting card containing at least one graphic and text information. 6. Make a poster for the forthcoming election and show the difference in resolution and quality. 7. Paint the scenery of a park. 8. Use effective cropping techniques to design a collage. 9. Display your name through the given background with at least five text effects and shadow emboss 10. Create a one minute theme video with suitable audio effects.

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 processing	PO1, PO2
3	To understand the framework of frames and bit images to animations	PO4, PO6
4	Learn about the cropping techniques	PO4, PO5, PO6
5	Understanding the concept of poster making	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

Naan Mudhalvan Substitute Courses

SEMESTER II

Subject Code	Subject Name	Category	L	T	P	Credits	Marks		
							CIA	External	Total
AECC1	**UNDERSTANDINGINTERNET**	Substitution	-	-	-	2		100	100

Learning Objectives	
LO1	KnowledgeofInternetmedium
LO2	Internetasamassmedium
LO3	FeaturesofInternetTechnology
LO4	Internetassourceofinfotainment
LO5	Studyofinternetaudiencesandaboutcybercrime

UNIT	**Contents**
I	Theemergenceofinternetasamassmedium–theworld ofworldwide web.
II	Featuresofinternetasatechnology.
III	Internetasasource ofinfotainment–classificationbasedoncontentandstyle.
IV	Demographicandpsychographicdescriptionsofinternet_audiences'– effectofinternetonthevaluesandlife-styles.
V	Presentissuessuchascybercrimeandfuture possibilities.

CourseOutcomes		**Programme Outcomes**
CO	Oncompletionofthiscourse,studentswill	
CO1	Knowthebasic conceptininternet Conceptof massmediumandworldwideweb	PO1, PO2, PO3,PO4,PO5,PO6
CO2	Knowtheconceptof internetasatechnology.	PO1, PO2, PO3,PO4,PO5,PO6
CO3	Understandthe concept to infotainment andclassificationbasedoncontent andstyle	PO1, PO2,PO3, PO4,PO5,PO6
CO4	KnowaboutDemographicandpsychographicdescriptionofinternet	PO1, PO2,PO3, PO4,PO5,PO6
CO5	Understandtheconceptofcybercrimeandfuturepossibilities	PO1, PO2, PO3,PO4,PO5,PO6

Textbooks

1. Barnouw,EandKrishnaswamyS[1990]IndianFilm.NewYork,OUP.
2. Kumar,Keval[1999]MassCommunicationinIndia.Mumbai,Jaico.
3. **Srivastava,KM[1992]MediaIssuesSterlingPublishersPvtLtd.**

	ReferenceBook
1	Acharya,RN[1987]TelevisioninIndia,ManasPublications,NewDelhi

2	Barnouw,E[1974]Documentary–AHistoryofNonfiction. Oxford,OUP
3	Luthra,HR[1986] IndianBroadcasting.Ministryof I& B,NewDelhi
4	Vasudev,Aruna[1986]TheNewIndianCinema.MacmillanIndia,NewDelhi
	WebResources
1.	https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf
2.	https://www.w3schools.com/html/default.asp

MappingwithProgrammeOutcomes:

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

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

SEMESTER III

Subject Code	Subject Name	Category	L	T	P	Credits	Inst. Hours	Marks		
								CIA	External	Total
AECC2	**Organizational Behaviour**	Substitution	-	-	-	2			100	100

Course Objectives	
LO1	To have extensive knowledge on OB and the scope of OB.
LO2	Tocreateawarenesson IndividualBehaviour.
LO3	ToenhancetheunderstandingofGroupBehaviour
LO4	Toknowthebasicsof Organizational Cultureand Organizational Structure
LO5	Tounderstand Organizational Change,ConflictandPower

UNIT	Details	No. of Hours
I	**INTRODUCTION**:ConceptofOrganizationalBehavior(OB):Nature,ScopeandRoleofOB:Disciplinesthatcontribute to OB; Opportunities for OB (Globalization, Indian workforce diversity, customer service, innovation and change, networked organizations, work-life balance,people skills,Positive work environment, ethics)	
II	**INDIVIDUALBEHAVIOUR:** 1. Learning, attitude and Job satisfaction: Concept of learning,conditioning, shaping and reinforcement. Concept of attitude,components, behavior and attitude. Job satisfaction: causation;impactof satisfiedemployeesonworkplace 2. Motivation : Concept; Theories (Hierarchy of needs, X andY, Two factor, McClelland, Goal setting, Self-efficacy, Equitytheory);Job characteristicsmodel;Redesigningjobs 3. Personality andValues : Conceptof personality; Myers-Briggs Type Indicator (MBTI); Big Five model. Relevance ofvalues;Linkingpersonalityandvaluestotheworkplace(person-jobfit,person-organizationfit) 4. Perception,DecisionMaking:PerceptionandJudgements; Factors;Linkingperceptiontoindividualdecisionmaking	

III	**GROUPBEHAVIOUR**:1.GroupsandWorkTeams:Concept:FiveStagemodelofgroupdevelopment;Groupnorms, cohesiveness ; Group think and shift ; Teams; types ofteams; Creating team players from individuals and team basedwork(TBW) 2. Leadership : Concept; Trait theories;Behavioraltheories(OhioandMichiganstudies);Contingency theories(Fiedler ,Hersey and Blanchard, Path-Goal)	

IV	ORGANISATIONALCULTURE AND STRUCTURE : Concept of culture; Impact (functions and liability); Creatingandsustainingculture:Conceptofstructure,Prevalentorganizationaldesigns:Newdesignoptions	
V	ORGANISATIONALCHANGE,CONFLICTANDPOWER: Forcesofchange;Plannedchange;Resistance;Approaches(Lewin's model,Organisationaldevelopment);.Conceptofconflict,Conflictprocess;Types,Functional/Dysfunctional. Introductiontopowerandpolitics.	

Course Outcomes	OnCompletionofthecoursethestudentswill be able	**ProgramOutcomes**
CO1	To define Organizational Behaviour, Understand the OpportunitythroughOB.	PO1,PO2,PO6, PO7
CO2	Toapplyself-awareness,motivation,leadershipandlearning Theoriesatworkplace.	PO2,PO4. PO5,PO6
CO3	Toanalyzethecomplexitiesandsolutionsofgroupbehaviour.	PO1, PO2,PO4, PO5, PO6
CO4	Tobringpositivechangeinthecultureofthe organization.	PO2,PO3,PO4PO5, PO8
CO5	Tocreateacongenial climate intheorganization.	PO1,PO2,PO5PO6, PO8

Text Books	
1.	NeharikaVohraStephenP.Robbins,TimothyA.Judge,OrganizationalBehaviour, PearsonEducation,18th Edition,2022.
2.	FredLuthans,OrganizationalBehaviour,TataMcGrawHill,2017.
3.	RayFrench,CharlotteRayner,GaryRees&SallyRumbles,OrganizationalBehaviour, JohnWiley&Sons,2011
4.	LouisBevoc,AllisonShearsett,RachaelCollinson,OrganizationalBehaviourReference, NutriNicheSystemLLC(28April2017)
5.	Dr.ChristopherP.Neck,JefferyD.Houghton andEmmaL.Murray,Organizational BehaviourASkill-BuildingApproach,SAGE Publications,Inc;2nd edition(29November2018).
ReferencesBooks	
1.	UmaSekaran,OrganizationalBehaviourText&cases,2nd edition,TataMcGrawHill PublishingCO. Ltd
2.	GangadharRao,Narayana, V.S.PRao,OrganizationalBehaviour1987,Reprint2000, KonarkPublisherPvt.Ltd, 1st edition
3.	S.S.Khanka,OrganizationalBehaviour,S.Chand&Co,NewDelhi.
4.	J. Jayasankar,OrganizationalBehaviour,MarghamPublications, Chennai,2017.

MappingwithProgrammeOutcomes:

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

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

SEMESTER IV

SubjectCode	SubjectName	Category	L	T	P	Credits	Inst.Hours	Marks		
								CIA	External	Total
AECC3	**Advanced Excel**	Substitution	-	-	-	2	-		100	100
CourseObjective										
LO1	Handlelargeamountsofdata									
LO2	Aggregatenumericdata andsummarizeintocategoriesandsubcategories									
LO3	Filtering,sorting,andgroupingdataorsubsetsofdata									
LO4	Createpivottablestoconsolidatedatafrommultiplefiles									
LO5	Presentingdataintheformofchartsandgraphs									
UNIT	**Details**						**No. of Hours**			
I	Basics of Excel-Customizing common options-Absoluteand relative cells-Protecting and un-protecting worksheetsandcells-Working with Functions-Writing conditionalexpressions-logicalfunctions-lookupandreferencefunctions-VlookUPwithExactMatch,ApproximateMatch-Nested VlookUP with Exact Match-VlookUP withTables,DynamicRanges-NestedVlookUPwithExactMatch-Using VLookUP to consolidate Data from MultipleSheets									

II	DataValidations-Specifyingavalidrangeofvalues-SpecifyingalistofvalidvaluesSpecifyingcustomvalidationsbasedonformulaWorkingwithTemplatesDesigningthestructureofatemplate-templatesforstandardization of worksheets - Sorting and Filtering Data -Sortingtables-multiple-levelsorting-customsorting-Filtering data for selected view -advanced filter options-Working with ReportsCreating subtotals-Multiple-levelsubtotal.	

III	Creating Pivot tables Formatting and customizing Pivot tables-advanced options of Pivot tables-Pivot ChartsConsolidatingdatafrommultiplesheetsandfilesusingPivottables-externaldatasources-dataconsolidationfeature to consolidate data-Show ValueAs % of Row,%of Column, Running Total, Compare with SpecificField-ViewingSubtotalunderPivot-CreatingSlicers.	
IV	More FunctionsDate and time functions-Text functions-Database functions-Power Functions – FormattingUsingauto formatting option for worksheets-Using conditionalformatting option for rows,columns andcells-WhatIfAnalysis- GoalSeek-DataTables-ScenarioManager.	
V	Charts -Formatting Charts-3D Graphs-Bar and LineChart together-Secondary Axis in Graphs-Sharing Chartswith PowerPoint/ MS Word,Dynamically- New FeaturesOfExcelSparklines,InlineCharts,dataCharts-Overviewof allthenewfeatures.	

CourseOutcomes		**ProgrammeOutcomes**
CO	Oncompletionofthiscourse,studentswill	
1	Workwithbigdatatoolsanditsanalysistechniques.	PO1
2	Analyzedatabyutilizingclusteringandclassification algorithms.	PO1,PO2
3	Learn and apply different miningAlgorithmsandrecommendationsystemsforlargevolumesofdata.	PO4,PO6
4	Performanalyticsondata streams.	PO4,PO5,PO6
5	LearnNo-SQLdatabasesandmanagement.	PO3,PO8
TextBook		
1	Excel2019All	
2	MicrosoftExcel2019PivotTable DataCrunching	
WebResources		

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

MappingwithProgrammeOutcomes:

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

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

SEMESTER V

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
AECC4	**PROBLEM SOLVING TECHNIQUES**	Substitution	-	-	-	-	2	-		100	100

Course Objective	
LO1	Understand the systematic approach to problem solving.
LO2	Know the approach and algorithms to solve specific fundamental problems.
LO3	Understand the efficient approach to solve specific factoring-related problems.
LO4	Understand the efficient array-related techniques to solve specific problems.
LO5	Understand the efficient methods to solve specific problems related to text processing. Understand how recursion works.

UNIT	**Details**	**No. of Hours**
I	**Introduction:** Notion of algorithms and programs – Requirements for solving problems by computer – The problem-solving aspect: Problem definition phase, Getting started on a problem, The use of specific examples, Similarities among problems, Working backwards from the solution – General problem-solving strategies - Problem solving using top-down design – Implementation of algorithms – The concept of Recursion.	
II	**Fundamental Algorithms**: Exchanging the values of two variables – Counting - Summation of a set of numbers - Factorial computation - Sine function computation - Fibonacci Series generation - Reversing the digits of an integer – Base Conversion.	
III	**Factoring Methods**: Finding the square root of a number – The smallest divisor of an integer – Greatest common divisor of two integers - Generating prime numbers – Computing the prime factors of an integer – Generation of pseudo-random numbers - Raising a number to a large power – Computing the *n*th Fibonacci number.	
IV	**Array Techniques**: Array order reversal – Array counting or histograming – Finding the maximum number in a set - Removal of duplicates from an ordered array - Partitioning an array – Finding the k^{th} smallest element – Longest monotone subsequence.	
V	**Text Processing and Pattern Searching**: Text line length adjustment – Left and right justification of text – Keyword searching in text – Text line editing – Linear pattern search. **Recursive algorithms**: Towers of Hanoi – Permutation generation.	

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
1	Understand the logic of problem and analyses implementation of algorithm and TopDown approach and concept of Recursion	PO1,PO6
2	Be able to understand the Sequence of Numbers and Series Fibonacci, Reversing ,Base Conversion.	PO2
3	Be able to do Algebraic operations	PO2,PO4
4	Have knowledge of Arrays and its Logics	PO6,PO8
5	Know Text Processing and Pattern Searching Approach	PO7
Text Book		
1	R. G. Dromey, How to Solve it by Computer, Pearson India, 2007	
Reference Books		
1.	George Polya, Jeremy Kilpatrick, The Stanford Mathematics Problem Book: With Hints and Solutions, Dover Publications, 2009 (Kindle Edition 2013).	
2.	Greg W. Scragg, Problem Solving with Computers, Jones & Bartlett 1st edition, 1996.	
Web Resources		
1.	https://www.studytonight.com/	
2.	https://www.w3schools.com/	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	**2**	**3**	**1**	**2**	**1**	**2**
CO 2	**2**	**2**	**2**	**1**	**3**	**1**
CO 3	**3**	**2**	**1**	**2**	**3**	**3**
CO 4	**2**	**2**	**3**	**2**	**3**	**3**
CO 5	**2**	**3**	**1**	**2**	**3**	2
Weightage of course contributed to each PSO	11	12	8	9	13	11

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

SEMESTER VI

Subject Code	Subject Name	Category	L	T	P	Credits	Inst.Hours	Marks		
								CIA	External	Total
AECC5	**Open SourceSoftware Technologies**	Substitution	-	-	-	2	-	-	100	100
CourseObjective										
LO1	AbletoAcquireandunderstand thebasicconceptsinJava,applicationofOOPSconcepts.									
LO2	Acquireknowledgeaboutoperatorsanddecision-makingstatements.									
LO3	ToIdentifythesignificanceand application ofClasses,arraysandinterfacesand analyzingjavaarrays									
LO4	UnderstandabouttheapplicationsofOOPSconceptsandanalyzeoverridingand PackagesthroughJavaprograms.									
LO5	CanCreatewindow-based programmingusingappletand graphicsprogramming.									
UNIT	**Details**									**No. of Hours**
I	OpenSource–opensourcevs.commercialsoftware–WhatisLinux –FreeSoftware–WhereIcanuseLinux-Linuxkernel–Linux distributions									
II	: Introduction Linux Essential Commands –File System concept – Standard Files –The Linux Security Model – Introduction to Unix – UnixComponentsUnixFiles–FileAttributesandPermissionStandardI/O– Redirection– PipesandFilters–GrepandStreamEditor									
III	Introduction - Apache Explained – Starting, Stopping and RestartingApache –Modifying the Default configuration – Securing Apache – SetuserandGroup									
IV	**MySQL:** Introduction to MySQL – The show databases andtable – The USE command –Create Database and Tables – DescribeTable– Select,Insert, UpdateandDeletestatementdatabase.									
V	**Introduction** –PHP Form processing – Database Access withPHP– MySQL,MySQLFunctions–InsertingRecords–SelectingRecords– DeletingRecords–UpdateRecords.									
CourseOutcomes								**ProgrammeOutcomes**		
CO	Oncompletionofthiscourse, studentswill									

1	Acquireandunderstandthebasicconceptsin Java and	PO1

	applicationofOOPSconcepts.	
2	Acquireknowledgeaboutoperatorsanddecision-making statements.	PO1,PO2
3	Identify thesignificance andapplicationof Classes,arraysandinterfacesandanalyzingjavaarrays	PO4,PO6
4	UnderstandabouttheapplicationsofOOPSconceptsand analyze overriding and packages through javaprograms.	PO4,PO5,PO6
5	Createwindow-based programmingusingappletand Graphicsprogramming.	PO3,PO8
TextBooks		
1	JamesLeeandBrentWare–OpenSourceWebDevelopmentwithLAMP	
2	LINUX,Apache,MySQL,PerlandPHP‖,DorlingKindersley(India)Pvt.Ltd,2008.	
ReferenceBooks		
1.	1. EricRosebrock,EricFilson,–SettingupLAMP:GettingLinux,Apache,MySQLand PHPandworkingtogether‖,JohnWileyandSons,2004.	
2.	2.AnthonyButcher,–TeachYourselfMySQLin21days‖,2nd Edition,SamsPublication.	
3.	3.RichBower,DanielLopezRidreejo,AlianLiska,–ApacheAdministrator's HandPublication.	
4.	4.TammyFox,–RedHatEnterpriseLinux5AdministrationUnleashed‖,SamsPublication.	
5.	5.NaramoreEligabette,GernerJason,WroxPress,WileyDreamtechPress,–BeginningPHP5,Apache,MySQLWeb Development‖,2005	
WebResources		
1.	IntroductiontoOpen-Sourceanditsbenefits-GeeksforGeeks	
2.	https://www.bing.com/	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	3	2	2	1	1
CO2	3	1	3	2	3	3
CO3	3	2	2	-	2	1
CO4	2	-	3	3	3	1
CO5	3	3	3	3	3	2
Weightageofcoursecontributedtoeach PSO	12	9	13	10	12	8

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