`

B.C.A.,

SYLLABUS

FROM THE ACADEMIC YEAR
2023 - 2024

TAMILNADU STATE COUNCIL FOR HIGHER EDUCATION, CHENNAI – 600 005

Introduction

BCA(BachelorofComputerApplication)

Education is the key to development of any society. Role of higher education is crucial for securingright kind of employment and also to pursue further studies in best available world class institutes elsewherewithin and outside India. Quality education in general and higher education in particular deserves highpriority to enable the young and future generation of students to acquire skill, training and knowledge inorder to enhance their thinking, creativity, comprehension and application abilities and prepare them tocompete, succeed and excel globally. Learning Outcomes-based Curriculum Framework (LOCF) whichmakes it student-centric, interactive and outcome-oriented with well-defined aims, objectives and goals toachieve. LOCF also aims at ensuring uniform education standard and content delivery across the state whichwillhelpthestudentstoensuresimilarqualityofeducationirrespectiveoftheinstituteandlocation.

Computer Application is the study of quantity, structure, space and change, focusing on problemsolving, application development with wider scope of application in science, engineering, technology, socialsciences etc. throughout the world in last couple of decades and it has carved out a space for itself like anyother disciplinesofbasicscienceandengineering.ComputerApplicationisadisciplinethat spanstheoryandpracticeanditrequiresthinkingbothinabstracttermsandinconcreteterms.Nowadays,practicallyev eryoneis a computer user, and many people are even computer programmers. Computer Application can be seen onahigherlevel,asascienceofproblemsolvingandproblemsolvingrequiresprecision, creativity,andcarefulreasoning.Theever-evolving disciplineof computerApplicationalsohasstrongconnections to otherdisciplines. Many problems in science, engineering, health care, business, and other areas can be solvedeffectivelywithcomputers,butfindingasolutionrequiresbothcomputerscienceexpertiseandknowledgeoft he particular application domain. Computer Application has a wide range of specialties. These includeComputer Architecture, Software Systems, Graphics, Artificial Intelligence, Computational Science, andSoftware Engineering. Drawing from a common core of computer science knowledge, each specialty areafocusesonspecificchallenges.ComputerApplicationispracticedbymathematicians,scientistsandengineers. Mathematics, the origins of Computer Science, provides reason and logic. Science provides themethodology for learning and refinement. Engineering provides the techniques for building hardware andsoftware.
ProgrammeOutcome,ProgrammeSpecificOutcomeandCourseOutcome

Computer Application is the study of quantity, structure, space and change, focusing on

problemsolving, application development with wider scope of application in science, engineering, technology, socialsciences etc. The key core areas of study in Mathematics include Algebra, Analysis (Real & Complex),DifferentialEquations,Geometry,andMechanics.

The Students completing this programme will be able to present Software application clearly andprecisely, make abstract ideas precise by formulating them in the Computer languages. Completion of thisprogrammewillalsoenablethelearnerstojointeachingprofession,enhancetheiremployabilityforgovernment jobs, jobs in software industry, banking, insurance and investment sectors, data analyst jobs andjobsin variousotherpublicand privateenterprises.

1. ProgrammeOutcomes(PO)ofBCA

- ScientificaptitudewillbedevelopedinStudents
- Students will acquire basic Practical skills & Technical knowledge along with domain knowledge ofdifferentsubjectsintheComputerScience&humanitiesstream.
- Students will become employable; Students will be eligible for career opportunities in educationfield, Industry,orwillbeabletooptforentrepreneurship.
- Students will possess basic subject knowledge required for higher studies, professional and appliedcourses.
- Students will be aware of and able to develop solution oriented approach towards various Social andEnvironmentalissues.
- Ability to acquire in-depth knowledge of several branches of Computer Science and aligned areas.This Programme helps learners in building a solid foundation for higher studies in Computer Scienceandapplications.
- Theskillsandknowledgegained leadstoproficiencyinanalyticalreasoning,whichcan beutilizedinmodellingand solving reallifeproblems.
- Utilizecomputerprogrammingskillstosolvetheoreticalandappliedproblemsbycriticalunderstanding,ana lysisandsynthesis.
- Torecognizepatternsandtoidentifyessentialandrelevantaspectsofproblems.
- Abilitytoshareideasandinsightswhileseekingandbenefittingfromknowledgeandinsightofothers.
- Mouldthestudentsintoresponsiblecitizensinarapidlychanginginterdependentsociety.

Theaboveexpectationsgenerallycanbepooledinto6 broadcategoriesandcan bemodifiedaccordingtoinstitutionalrequirements:

PO1:Knowledge

PO2:ProblemAnalysis

PO3:Design/DevelopmentofSolutions

PO4:ConductinvestigationsofcomplexproblemsPO5:M

odern toolusage

PO6:Applyingtosociety

2. ProgrammeSpecificOutcomesofB.Sc.DegreeProgrammeinComputerScience

PSO1:Thinkinacriticalandlogicalbasedmanner

PSO2:Familiarizethestudents with suitable software tools of computer science andindustrialapplications to handle issues and solve problems in mathematics orstatisticsandrealtimeapplication relatedsciences.

PSO3:Knowwhen there is a need for information, to be able to identify, locate, evaluate,andeffectivelyusethatinformationfortheissueorproblemathand.

PSO4:Understand,formulate,developprogrammingmodelwith logical approaches to aAddressissuesarisinginsocialscience,businessandothercontexts.

PSO5:Acquiregoodknowledgeand understanding tosolvespecific theoretical and appliedproblemsinadvancedareasofComputerscienceandIndustrial statistics.

PO6:Providestudents/learnerssufficientknowledgeandskillsenabling them to undertakefurther studies in Computer Science or Applications or Information Technology and itsalliedareasonmultipledisciplineslinkedwithComputerScience.

PO7:EquipwithComputerscience technical ability, problem solving skills, creative talentandpowerofcommunicationnecessaryforvariousformsofemployment.

PO8:Developarange of generic skills helpful in employment, internships&societalactivities.

PO9:Getadequateexposuretoglobalandlocal concerns that provides platform for furtherexplorationintomulti-dimensionalaspectsofcomputingsciences.

MappingofCourseLearningOutcomes(CLOs)withProgrammeOutcomes(POs)andProgrammeSpecificOutcomes(PSOs)canbecarriedoutaccordingly,assigningtheappropriatelevelinthegrids:

(puttickmark ineach row)

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

3. HighlightsoftheRevampedCurriculum

- Student-centric,meeting the demands of industry & society, incorporating industrial components,hands-ontraining,skill enhancement modules,industrialproject,projectwithviva-voce,exposuretoentrepreneurialskills,training forcompetitive examinations,sustaining the quality of the corecomponentsandincorporatingapplicationorientedcontentwhereverrequired.
- TheCoresubjects include latestdevelopments intheeducation andscientificfront, advancedprogramming packages allied with the discipline topics, practical training, devising mathematicalmodelsandalgorithmsforprovidingsolutionstoindustry/real
- lifesituations.Thecurriculumalsofacilitatespeerlearningwithadvancedmathematicaltopicsinthefinal semester, cateringtotheneedsofstakeholderswithresearchaptitude.
- The General Studies and Computer Science based problem solving skills are included as mandatorycomponentsinthe‗TrainingforCompetitiveExaminations'courseatthefinalsemester,afirst ofitskind.
- The curriculum is designed so as to strengthen the Industry-Academia interface and provide morejobopportunitiesforthestudents.
- The Industrial Statistics course is newly introduced in the fourth semester,to expose the students toreal life problems and train the students on designing a mathematical model to provide solutions totheindustrialproblems.
- The Internship during the second year vacation will help the students gain valuable work experiencethat connects classroom knowledge to real world experience and to narrow down and focus on thecareerpath.
- Project withviva-vocecomponentinthefifthsemesterenablesthestudent, applicationofconceptualknowledgetopracticalsituations.Thestateofarttechnologiesinconductinga Explaininascientificand systematic way and arriving at a precise solution is ensured. Such innovative provisions of theindustrial training, project and internships will give students an edge over the counterparts in the jobmarket.

State-ofArttechniquesfromthestreamsofmulti-disciplinary,crossdisciplinaryandinterdisciplinarynatureare incorporated as Elective courses, covering conventional topics to the latest – Statistics with RProgramming,DataScience,Machinelearning.InternetofThingsandArtificialIntelligenceetc..

4. ValueadditionsintheRevampedCurriculum:

Semester	Newly introduced Components	Outcome/Benefits
I	**FoundationCourse** To ease the transition oflearningfromhighersecondarytohighereducation, providinganoverviewofthepedagogyoflearningabstract Mathematics andsimulatingmathematical conceptstorealworld.	• Instilconfidenceamongstudents • Createinterest forthesubject
I,II,III,IV	**SkillEnhancementpapers** (Disciplinecentric/Generic/Entrepreneurial)	• Industryreadygraduates • Skilledhumanresource • Studentsareequippedwithessentialskillstomakethememployable
		• Trainingon Computing / Computational skills enablethestudentsgainknowledgeandexposureonlatestcomputationalaspects
		• Dataanalytical skills will enable students gain internships,apprenticeships,fieldworkinvolvingdatacollection,compilation,analysisetc.
		• Entrepreneurial skill training will provide anopportunityforindependent livelihood • Generatesself–employment • Createsmallscaleentrepreneurs • Trainingtogirlsleadstowomenempowerment
		• DisciplinecentricskillwillimprovetheTechnicalknowhowofsolvingreallifeproblemsusingICT tools

III,IV,V &VI	Electivepapers- An open choice of topicscategorized under GenericandDisciplineCentric	• Strengtheningthedomainknowledge • IntroducingthestakeholderstotheState-ofArttechniques from the streams of multi-disciplinary,crossdisciplinaryandinterdisciplinarynature • Students are exposed to Latest topics on ComputerScience/IT,thatrequirestrongmathematical background • Emerging topics inhighereducation /industry /communicationnetwork/healthsectoretc.areintroducedwithhands-on-training,facilitatesdesigningofmathematicalmodelsintherespective sectors
IV	IndustrialStatistics	• Exposuretoindustrymouldsstudentsintosolutionproviders • GeneratesIndustryreadygraduates • Employmentopportunitiesenhanced
II year Vacation activity	Internship /IndustrialTraining	• Practical training at the Industry/ Banking Sector /Private/ Publicsector organizations / Educationalinstitutions,enablethestudentsgainprofessional experienceandalsobecomeresponsiblecitizens.
V Semester	ProjectwithViva–voce	• Self-learningisenhanced • Applicationoftheconcepttorealsituationisconceivedresultingintangibleoutcome
VI Semester	Introduction ofProfessionalCompetencycomponent	• Curriculum designaccommodates allcategoryoflearners;_MathematicsforAdvancedExplain‘componentwillcompriseofadvancedtopicsinMathematics and allied fields, for those in the peergroup/aspiringresearchers; • _Training for Competitive Examinations‘ –caters tothe needs of the aspirants towards most sought-after services of the nation viz, UPSC, CDS, NDA,BankingServices,CAT,TNPSCgroupservices, etc.
ExtraCredits: ForAdvancedLearners/Honorsdegree		• Tocatertotheneedsofpeerlearners/researchaspirants

Skills acquired fromtheCourse	Knowledge,ProblemSolving,Analyticalability,ProfessionalCompetency,ProfessionalCommunicationandTransferrableSkill

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Credit Distribution for UG Programmes

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

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

First Year – Semester-I

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

Semester-II

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

Second Year – Semester-III

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

Semester-IV

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

	Skill Enhancement Course -SEC-7 (Discipline / Subject Specific)	2	2
	E.V.S	2	1
		25	**30**

Third Year
Semester-V

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

Semester-VI

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

Consolidated Semester wise and Component wise Credit distribution

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

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

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

Semester-I

Part	ListofCourses	Credit	Hours perweek (L/T/P)
Part-I	Language	3	6
Part-II	English	3	6
Part-III	CC1–PythonProgramming	5	5
	CC2-Practical:PythonProgrammingLab	5	5
	ElectiveCourse1(Generic/DisciplineSpecific)–EC1**Choosefrom Annexure–I**	3	4
Part-IV	SkillEnhancementCourse-SEC-1–**ChoosefromAnnexure-II**	2	2
	FoundationCourseFC–StructuredprogramminginC	2	2
		23	**30**

Semester-II

Part	ListofCourses	Credit	Hours per week(L/T/P)
Part-I	Language	3	6
Part-II	English	3	6
Part-III	CC3–ObjectOrientedProgrammingConceptsusingC++	5	5
	CC4 -Practical:C++ProgrammingLab	5	5
	ElectiveCourse2(Generic/DisciplineSpecific)–EC2 **ChoosefromAnnexure-I**	3	4
Part-IV	SkillEnhancementCourse-SEC-2-**ChoosefromAnnexure-II**	2	2
	SkillEnhancementCourse–SEC-3(Discipline/Subject Specific)–**ChoosefromAnnexure-II**	2	2
		23	**30**

SecondYear

Semester-III

Part	ListofCourses	Credit	Hours per week(L/T/P)
Part-I	Language	3	6
Part-II	English	3	6
Part-III	CC5-DataStructuresandAlgorithms	5	5
	CC6-Practical:DataStructuresandAlgorithmsLab	5	5
	ElectiveCourse3(Generic/DisciplineSpecific)-EC3-**Choose fromAnnexure-I**	3	4
Part-IV	SkillEnhancementCourse-SEC-4(EntrepreneurialBased)– **-ChoosefromAnnexure-II**	1	1
	SkillEnhancementCourse-SEC-5(DisciplineSpecific/Generic) –**ChoosefromAnnexure-II**	2	2
	EnvironmentalStudies	-	1
		22	**30**

Semester-IV

Part	ListofCourses	Credit	Hours perweek (L/T/P)
Part-I	Language	3	6
Part-II	English	3	6
Part-III	CC7-ProgramminginJava	5	5
	CC8 -Practical:ProgramminginJavaLab	5	5
	ElectiveCourse-EC4(Generic/DisciplineSpecific)– **ChoosefromAnnexure-I**	3	3
Part-IV	SkillEnhancementCourse–SEC-6-**ChoosefromAnnexure-II**	2	2
	SkillEnhancementCourse-SEC-7 -**ChoosefromAnnexure-II**	2	2
	EnvironmentalStudies	2	1
		25	**30**

Third

YearSemes

ter-V

Part	ListofCourses	Credit	Hoursper week(L/T/P)
Part-III	CC9–OperatingSystem	4	5
	CC10-ASP.NetProgramming	4	5
	CC11-Practical:ASP.NetProgrammingLab	4	5
	ElectiveCourse–EC5(DisciplineSpecific)– **ChoosefromAnnexure-I**	3	4
	ElectiveCourse–EC6(DisciplineSpecific)– **ChoosefromAnnexure-I**	3	4
	CC12-ProjectwithVivavoce(Individual)	4	5
Part-IV	ValueEducation	2	2
	Internship/IndustrialTraining (SummervacationattheendofIVsemesteractivity)	2	
		26	**30**

Semester-VI

Part	ListofCourses	Credit	Hours perweek(L/T/P)
Part-III	CC13-ComputerNetworks		6
	CC14–DataAnalyticsusingRProgramming	4	6
	CC15- Practical:RProgrammingLab	4	6
	ElectiveCourse–EC7(DisciplineSpecific)– **ChoosefromAnnexure-I**	3	5
	ElectiveCourse–EC8(DisciplineSpecific)– **ChoosefromAnnexure-I**	3	5
Part-IV	ProfessionalCompetencySkillEnhancementCourse-SEC8	2	2
Part-V	ExtensionActivity	1	
		21	**30**

TotalCredits: 140

AnnexureI

SuggestedtopicsinCorecomponent

1. MicroprocessorandMicrocontroller
2. MicroprocessorandMicrocontrollerLab
3. RDBMSwithPL/SQL
4. PL/SQLLab
5. SoftwareEngineering
6. MachineLearning
7. MachineLearningLab
8. NetworkSecurity
9. DataMiningandWarehousing
10. MobileApplicationDevelopment
11. MobileApplicationDevelopmentLab
12. IntroductiontoDataScienceandmore..

SuggestedtopicsinElectiveCourse

GenericSpecific

1. DiscreteMathematics–I
2. DiscreteMathematics-II
3. StatisticalMethodsanditsApplication-I
4. StatisticalMethodsanditsApplication-II
5. OptimizationTechniques
6. NanoTechnology
7. IntroductiontoLinearAlgebra
8. GraphTheoryanditsApplication
9. FinancialAccounting
10. CostandManagementAccounting
11. DigitalLogicFundamentals
12. NumericalMethods
13. ResourceManagementTechniquesandmore..

Electivecourse–(EC1-EC8)-DisciplineSpecific

1. SoftwareMetrics
2. NaturalLanguageProcessing
3. AnalyticsforServiceIndustry
4. Cryptography
5. DatabaseManagementSystem
6. BigDataAnalytics
7. IOTanditsApplications
8. SoftwareProjectManagement
9. ImageProcessing
10. InformationSecurity
11. HumanComputerInteraction
12. Fuzzy Logic
13. ArtificialIntelligence
14. MobileAdhocNetwork
15. ComputationalIntelligence
16. GridComputing
17. CloudComputing
18. ArtificialNeuralNetwork
19. AgileProjectManagementandmore..

[Pl.Note:InSemester-VI-ForEC7andEC8subjects Instructionalhoursmaybeusedas:5per cycle]

AnnexureII

SuggestedtopicsinSkillEnhancement(SEC1-SEC8)Course

SkillEnhancementCourse

1. FundamentalsofInformationTechnology
2. IntroductiontoHTML
3. WebDesigning
4. PHPProgramming
5. Software Testing
6. ProblemSolvingTechniques
7. UnderstandingInternet
8. OfficeAutomation
9. Quantitative Aptitude
10. OpenSourceTechnologies
11. MultimediaSystems
12. AdvancedExcel
13. Biometrics
14. CyberForensics
15. PatternRecognition
16. EnterpriseResourcePlanning
17. RoboticsandApplications
18. Simulationand Modelling
19. OrganizationBehaviorandmore..

COREPAPER

FIRSTYEARSE

MESTER-I

Subject Code	SubjectName	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
CC1	PYTHONPROGRAMMING		5	-	-	-	4	25	75	100

LearningObjectives	
LO1	To makestudents understandthe concepts of Python programming.
LO2	ToapplytheOOPsconceptinPYTHONprogramming.
LO3	Toimpartknowledgeondemandandsupplyconcepts
LO4	TomakethestudentslearnbestpracticesinPYTHONprogramming
LO5	Toknowthecostsandprofit maximization

UNIT	Contents	No. ofHours
I	**BasicsofPythonProgramming:**HistoryofPython-FeaturesofPython-Literal-Constants-Variables - Identifiers–Keywords-Built-inDataTypes-OutputStatements –Input Statements-Comments –Indentation- Operators-Expressions-Type conversions. **PythonArrays:**DefiningandProcessingArrays–Arraymethods.	**15**
II	**ControlStatements:**Selection/Conditional Branchingstatements: if,if-else,nestedifand if-elif-else statements. Iterative Statements: whileloop,forloop,elsesuiteinloopand nested loops. **Jump Statements:**break,continueandpassstatements**.**	**15**
III	**Functions:** Function Definition – Function Call – Variable Scope and itsLifetime-ReturnStatement.**FunctionArguments**:RequiredArguments,Keyword Arguments, Default Arguments and Variable LengthArguments-Recursion.**PythonStrings:**Stringoperations- ImmutableStrings - Built-in String Methods and Functions - String Comparison.	**15**

	Modules: import statement- The Python module – dir() function –	

	ModulesandNamespace–Definingourownmodules.	
IV	**Lists:**Creatingalist-Accessvaluesin List-Updating values in Lists-Nestedlists-Basiclistoperations-List Methods. Tuples: Creating,Accessing,UpdatingandDeletingElementsin atuple–Nestedtuples–Differencebetweenlistsandtuples.**Dictionaries:**Creating,Accessing,UpdatingandDeletingElementsinaDictionary–DictionaryFunctions andMethods-DifferencebetweenListsandDictionaries.	**15**
V	**PythonFileHandling:**Typesof files in Python -Opening and Closingfiles-Reading and Writing files: write() and writelines() methods-append()method–read()andreadlines()methods–withkeyword–Splittingwords –Filemethods-FilePositions-Renaminganddeletingfiles.	**15**
	TOTALHOURS	**75**

CourseOutcomes		**ProgrammeOutcomes**
CO	Oncompletionofthiscourse, studentswill	
CO1	Learnthebasicsofpython,Dosimpleprogramsonpython, Learnhowtouseanarray.	PO1,PO2,PO3, PO4,PO5,PO6
CO2	Developprogramusingselectionstatement,WorkwithLoopingandjump statements,DoprogramsonLoopsandjumpstatements.	PO1,PO2,PO3, PO4,PO5,PO6
CO3	Concept of function, function arguments, Implementing theconceptstringsinvariousapplication,SignificanceofModules, Work withfunctions,Stringsandmodules.	PO1,PO2,PO3, PO4,PO5,PO6
CO4	WorkwithList,tuplesanddictionary,Writeprogramusinglist, tuplesanddictionary.	PO1,PO2,PO3, PO4,PO5,PO6
CO5	UsageofFilehandlingsinpython,Conceptofreadingandwritingfiles ,Doprogramsusingfiles.	PO1,PO2,PO3, PO4,PO5,PO6

Textbooks

1	ReemaThareja,–PythonProgrammingusingproblemsolvingapproach‖,FirstEdition, 2017,Oxford UniversityPress.
2	Dr.R.NageswaraRao,–CorePythonProgramming‖,FirstEdition,2017,Dreamtech Publishers.

ReferenceBooks

1.	VamsiKurama,–PythonProgramming:AModernApproach‖,PearsonEducation.
2.	MarkLutz,‖LearningPython‖,Orielly.
3.	AdamStewarts,–PythonProgramming‖,Online.
4.	FabioNelli,–PythonDataAnalytics‖,APress.

5.	KennethA.Lambert,–FundamentalsofPython–FirstPrograms‖,CENGAGE Publication.
WebResources	
1.	https://www.programiz.com/python-programming
2.	https://www.guru99.com/python-tutorials.html
3.	https://www.w3schools.com/python/python_intro.asp
4.	https://www.geeksforgeeks.org/python-programming-language/
5.	https://en.wikipedia.org/wiki/Python_(programming_language)

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**2**	**2**	**3**	**3**	**3**
CO2	**3**	**2**	**2**	**3**	**2**	**3**
CO3	**3**	**2**	**2**	**3**	**2**	**2**
CO4	**3**	**2**	**2**	**3**	**2**	**3**
CO5	**3**	**2**	**2**	**3**	**3**	**3**
Weightageofcoursecontributedtoeach PSO	15	10	10	15	13	14

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
CC2	PYTHONLAB		-	-	4	-	4	25	75	100

CourseObjectives:

1. Beabletodesignandprogram Pythonapplications.
2. Beabletocreateloopsanddecisionstatementsin Python.
3. Beabletoworkwithfunctionsandpassargumentsin Python.
4. Beabletobuildandpackage Pythonmodulesfor reusability.
5. Beabletoreadandwritefilesin Python.

LABEXERCISES	RequiredHours
1. Programusingvariables,constants,I/OstatementsinPython. 2. ProgramusingOperatorsinPython. 3. ProgramusingConditionalStatements. 4. ProgramusingLoops. 5. ProgramusingJumpStatements. 6. ProgramusingFunctions. 7. ProgramusingRecursion. 8. ProgramusingArrays. 9. ProgramusingStrings. 10. ProgramusingModules. 11. ProgramusingLists. 12. ProgramusingTuples. 13. ProgramusingDictionaries. 14. ProgramforFileHandling.	**60**

CourseOutcomes

Oncompletionofthiscourse, studentswill

CO1	Demonstratetheunderstandingofsyntaxandsemanticsof
CO2	IdentifytheproblemandsolveusingPYTHONprogrammingtechniques.
CO3	Identifysuitableprogrammingconstructsforproblemsolving.
CO4	AnalyzevariousconceptsofPYTHONlanguagetosolvetheprobleminanefficient way.
CO5	DevelopaPYTHONprogramforagivenproblemandtestforitscorrectness.

MappingwithProgrammeOutcomes:

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

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
FC	**StructuredProgrammingLanguageinC**	FC	2	-	-	-	2	2	25	75	100
CourseObjective											
LO1	TofamiliarizethestudentswiththeProgrammingbasicsandthefundamentalsofC, DatatypesinC,Mathematicalandlogicaloperations.										
LO2	Tounderstandtheconceptusingifstatementsandloops										
LO3	ThisunitcoverstheconceptofArrays										
LO4	ThisunitcoverstheconceptofFunctions										
LO5	Tounderstandtheconceptofimplementingpointers.										

UNIT	Details	No. ofHours	CourseObjectives
I	**OverviewofC**:ImportanceofC,sampleCprogram,Cprogramstructure,executingCprogram. Constants, Variables, and Data Types: Character set, C tokens,keywordsandidentifiers,constants,variables,datatypes,declarationofvariables,Assigningvaluestovariables--- Assignmentstatement,declaringavariableasconstant,as volatile.OperatorsandExpression.	6	CO1
II	**Decision Making and Branching**:Decision making with If,simpleIF,IFELSE,nestedIFELSE,ELSEIFladder,switch,GOTOstatement.**DecisionMakingand Looping**:While, Do-While,For,Jumpsinloops.	6	CO2
III	**Arrays**:Declarationandaccessingofone&two-dimensionalarrays,initializingtwo-dimensionalarrays,multidimensional arrays.	6	CO3
IV	**Functions**: The form of C functions, Return values and types,calling a function, categories of functions, Nested functions,Recursion,functionswitharrays,callbyvalue,callbyreference,storageclasses-characterarraysandstringfunctions	6	CO4

V	**Pointers:**definition,declaringandinitializingpointers,accessing avariablethroughaddressandthroughpointer,pointer expressions, pointer increments and scale factor, pointers and arrays, pointers and functions, pointers and	6	CO5

	structures.		
	Total	**30**	
CourseOutcomes		**ProgrammeOutcome**	
CO	Oncompletionofthiscourse, studentswill		
1	RemembertheprogramstructureofCwithitssyntaxandsemantics	PO1,PO3,PO5	
2	UnderstandtheprogrammingprinciplesinC(datatypes, operators, branching and looping, arrays,functions,structures, pointersandfiles)	PO2,PO3,PO6,PO7	
3	Applytheprogrammingprinciplesearntinreal-timeproblems	PO3,PO4,PO7	
4	Analyzethevariousmethodsofsolvingaproblemand choosethebestmethod	PO4,PO5,PO6	
5	Code,debugandtesttheprogramswithappropriate testcases	PO7,PO8	
TextBook			
1	E.Balagurusamy,ProgramminginANSIC,FifthEdition,TataMcGraw-Hill,2010.		
ReferenceBooks			
1.	ByronGottfried,Schaum'sOutlineProgrammingwithC,FourthEdition,TataMcGraw-Hill,2018.		
2.	KernighanandRitchie,TheCProgrammingLanguage,SecondEdition,PrenticeHall, 1998		
3.	YashavantKanetkar,LetUsC,EighteenthEdition,BPBPublications,2021		
WebResources			
1.	https://codeforwin.org/		
2.	https://www.geeksforgeeks.org/c-programming-language/		
3.	http://en.cppreference.com/w/c		
4.	http://learn-c.org/		
5.	https://www.cprogramming.com/		

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**1**	**2**	**2**	**2**	**2**	**-**
CO2	**2**	**2**	**2**	**2**	**-**	**2**
CO3	**3**	**2**	**2**	**1**	**1**	**-**
CO4	**3**	**2**	**2**	**1**	**-**	**1**
CO5	**1**	**2**	**2**	**2**	**2**	**3**
Weightageofcoursecontributedtoeach PSO	7	10	10	18	15	6

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

SEMESTERII

Titleofthe Course/Paper	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
CC3	**OBJECTORIENTEDPROGRAMMING CONCEPTSUSINGC++**	Core	5	-	-	-	4	5	25	75	100
CourseObjective											
LO1	Describe theproceduralandobjectorientedparadigmwithconceptsofstreams, classes,functions,dataandobjects										
LO2	Understanddynamicmemory managementtechniquesusingpointers,constructors,destructors,etc										
LO3	Describetheconceptoffunctionoverloading,operatoroverloading,virtualfunctionsandpolymorphism										
LO4	Classifyinheritancewiththeunderstandingofearlyandlatebinding,usageofexceptionhandling,genericprogramming										
LO5	DemonstratetheuseofvariousOOPsconceptswiththehelpofprograms										
UNIT	**Details**										**No. ofHours**
I	Introduction to C++ - key concepts of Object-Oriented Programming – Advantages–ObjectOrientedLanguages–I/OinC++- C++Declarations.ControlStructures:- DecisionMakingandStatements:If ..else, jump, goto, break, continue, Switch case statements - Loops inC++ :for, while, do - functions in C++ - inline functions – FunctionOverloading.										15
II	Classes and Objects: Declaring Objects – Defining Member Functions – StaticMembervariablesandfunctions–arrayofobjects–friendfunctions – Overloading member functions – Bit fields and classes – Constructoranddestructorwithstaticmembers.										15
III	OperatorOverloading:Overloadingunary,binaryoperators–Overloading Friend functions –type conversion – Inheritance: Types ofInheritance – Single, Multilevel, Multiple, Hierarchal,Hybrid, Multi pathinheritance– Virtual baseClasses–AbstractClasses.										15
IV	Pointers–Declaration–PointertoClass,Object–thispointer–Pointers										15

	to derived classes andBase classes – Arrays – Characteristics – array ofclasses – Memory models – new and deleteoperators – dynamic object –Binding, PolymorphismandVirtualFunctions.	
V	Files –Filestreamclasses –filemodes–Sequential Read /Writeoperations– BinaryandASCIIFiles–RandomAccessOperation–Templates –Exception Handling- String –Declaring andInitializingstringobjects– StringAttributes–Miscellaneousfunctions.	15
	Total	**75**

CourseOutcomes		**ProgrammeOutcome**
CO	Uponcompletionofthecoursethe studentswouldbe ableto:	
1	RemembertheprogramstructureofCwithitssyntaxandseman tics	PO1,PO6
2	UnderstandtheprogrammingprinciplesinC(datatypes,operat ors, branchingandlooping, arrays,functions, structures,pointersandfiles)	PO2
3	Applytheprogrammingprincipleslearntinreal-timeproblems	PO4,PO7
4	Analyzethevariousmethodsofsolvingaproblem andchoosethebestmethod	PO6
5	Code,debugandtesttheprogramswithappropriatetest cases	PO7,PO8
TextBook		
1	E.Balagurusamy,–Object-OrientedProgrammingwithC++‖,TMH2013,7thEdition.	
ReferenceBooks		
1.	AshokNKamthane,–Object-OrientedProgrammingwithANSIandTurboC++‖, PearsonEducation2003.	
2.	MariaLitvin&GrayLitvin,–C++foryou‖,Vikaspublication2002.	
WebResources		
1.	https://alison.com/course/introduction-to-c-plus-plus-programming	

MappingwithProgrammeOutcomes:

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

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

Titleofthe Course/Paper	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
CC4	**C++PROGRAMMINGLAB**	Core	-	-	4	-	4	4	25	75	100
CourseObjective											
LO1	Describetheproceduralandobjectorientedparadigmwithconceptsofstreams, classes,functions,dataandobjects										
LO2	Understand dynamicmemory managementtechniquesusingpointers,constructors,destructors,etc										
LO3	Describetheconceptoffunctionoverloading,operator overloading,virtualfunctionsandpolymorphism										
LO4	Classifyinheritancewiththeunderstandingofearlyandlatebinding,usageofexceptionhandling,genericprogramming										
LO5	DemonstratetheuseofvariousOOPsconceptswiththehelpofprograms										
S.No	**Details**										**No. ofHours**
1	Writea C++ program to demonstrate function overloading, Default ArgumentsandInlinefunction.										
2	WriteaC++programtodemonstrateClassandObjects										
3	WriteaC++programtodemonstratetheconceptofPassingObjectstoFunctions										
4	WriteaC++programtodemonstratetheFriendFunctions.										
5	WriteaC++programtodemonstratetheconceptofPassingObjectsto Functions										
6	Writea C++programtodemonstrateConstructorandDestructor										
7	WriteaC++programtodemonstrateUnaryOperatorOverloading										
8	WriteaC++programtodemonstrateBinaryOperatorOverloading										

9	WriteaC++programtodemonstrate: • SingleInheritance • MultilevelInheritance • MultipleInheritance • HierarchicalInheritance • HybridInheritance	
10	WriteaC++programtodemonstrateVirtualFunctions.	
11	WriteaC++programtomanipulateaTextFile.	
12	WriteaC++programtoperformSequentialI/O Operationsonafile.	
13	WriteaC++programtofindtheBiggestNumberusingCommandLineArguments	
14	WriteaC++programtodemonstrateClassTemplate	
15	WriteaC++programtodemonstrateFunctionTemplate.	
16	WriteaC++programtodemonstrateExceptionHandling.	

CourseOutcomes		**ProgrammeOutcome**
CO	Uponcompletionofthecourse the studentswouldbeableto:	
1	RemembertheprogramstructureofCwithitssyntaxandsemantics	PO1,PO6
2	UnderstandtheprogrammingprinciplesinC(datatypes,operators, branching and looping, arrays, functions,structures,pointersandfiles)	PO2
3	Applytheprogrammingprincipleslearntinreal-timeproblems	PO4,PO7
4	Analyzethevariousmethodsofsolvingaproblemand choosethebestmethod	PO6
5	Code, debug and test the programs with appropriate testcases	PO7,PO8

TextBook	
1	E.Balagurusamy,–Object-OrientedProgrammingwithC++‖,TMH2013,7thEdition.
ReferenceBooks	

1.	AshokNKamthane,–Object-OrientedProgrammingwithANSIandTurboC++‖, PearsonEducation2003.
2.	MariaLitvin&GrayLitvin,–C++foryou‖,Vikaspublication2002.
WebResources	
1.	https://alison.com/course/introduction-to-c-plus-plus-programming

MappingwithProgrammeOutcomes:

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

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

SECONDYEAR

SemesterIII

Titleofthe Course/Paper	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
CC5	**DATASTRUCTURESAND ALGORITHMS**	Core	5	-	-	-	4	5	25	75	100
CourseObjective											
LO1	TounderstandtheconceptsofADTs										
LO2	Tolearnlineardatastructures-lists,stacks,queues										
LO3	TolearnTreestructuresandapplicationoftrees										
LO4	Tolearngraphstruturesandandapplicationofgraphs										
LO5	Tounderstandvarioussortingandsearching										
UNIT	**Details**										**No.of Hours**
I	Abstract Data Types (ADTs)- List ADT-array-based implementation-linked list implementationsingly linked lists-circular linked lists-doubly-linkedlists-applicationsoflists-PolynomialManipulation-Alloperations-Insertion-Deletion-Merge-Traversal										15
II	StackADT-Operations-Applications-Evaluatingarithmeticexpressions –Conversionofinfixtopostfixexpression-QueueADT-Operations-CircularQueue-PriorityQueue-deQueueapplicationsofqueues.										15
III	TreeADT-treetraversals-BinaryTreeADT-expressiontrees-applications of trees-binary search tree ADT- Threaded Binary Trees-AVL Trees-B-Tree-B+Tree –Heap-Applicationsofheap.										15
IV	Definition-RepresentationofGraph-Typesofgraph-Breadthfirsttraversal – Depth first traversal-Topological sort- Bi-connectivity – Cutvertex-Eulercircuits-Applicationsofgraphs.										15
V	Searching- Linear search-Binary search-Sorting-Bubble sort-Selectionsort-Insertionsort-Shellsort-Radixsort-Hashing-Hashfunctions-Separatechaining-OpenAddressing-RehashingExtendibleHashing										15
	Total										**75**

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

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**3**	**3**	**-**	**1**	**-**
CO2	**1**	**2**	**1**	**-**	**-**	**-**
CO3	**3**	**1**	**2**	**1**	**-**	**-**
CO4	**2**	**2**	**1**	**-**	**-**	**1**
CO5	**3**	**1**	**1**	**-**	**-**	**-**
Weightageofcourse contributedtoeach PSO	12	9	8	1	1	1

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

Titleofthe Course/Paper	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
CC6	**DATASTRUCTURESANDALGORITHMS LABusingC++**	Core	-	-	4	-	4	4	25	75	100
CourseObjective											
LO1	TounderstandtheconceptsofADTs										
LO2	Tolearnlineardatastructures-lists,stacks,queues										
LO3	TolearnTreestructuresandapplicationoftrees										
LO4	Tolearngraphstruturesandandapplicationofgraphs										
LO5	Tounderstandvarioussortingandsearching										
Sl.No	**Details**										**No.of Hours**
1.	Write aprogramtoimplementtheListADTusingarraysandlinked lists.										
2.	Writeaprogramstoimplementthefollowingusingasinglylinkedlist. • StackADT • QueueADT										
3.	Writeaprogramthatreadsaninfixexpression,convertstheexpression topostfixform andthenevaluatesthepostfixexpression (usestackADT).										
4.	WriteaprogramtoimplementpriorityqueueADT.										
5.	Writeaprogramtoperformthefollowingoperations: • Insertanelementintoa binary searchtree. • Deleteanelementfromabinarysearchtree. • Searchforakeyelementina binarysearchtree.										
6.	Writeaprogramtoperformthefollowingoperations • InsertionintoanAVL-tree • DeletionfromanAVL-tree										

7.	Writeaprogramsfortheimplementationof BFSandDFSforagivengraph.	
8	Writeaprogramsforimplementingthefollowingsearchingmethods: • Linearsearch • Binarysearch.	
9.	Writeaprogramsforimplementingthefollowingsortingmethods: • Bubblesort • Selectionsort • Insertionsort • Radixsort.	
	Total	

CourseOutcomes		**ProgrammemOutcome**
CO	Oncompletionofthiscourse, studentswill	
1	Understandtheconcept ofDynamicmemory management,datatypes, algorithms, BigOnotation	PO1,PO4,PO5
2	Understand basic data structures such as arrays, linkedlists,stacksandqueues	PO1,PO4,PO8
3	Describethehashfunctionandconceptsofcollisionand itsresolutionmethods	PO1,PO3,PO6
4	Solveprobleminvolvinggraphs,treesandheaps	PO3,PO4
5	Apply Algorithm for solving problems like sorting,searching,insertionanddeletionof data	PO1,PO5,PO6
TextBook		
1	MarkAllenWeiss,–DataStructuresandAlgorithmAnalysisinC++‖,Pearson Education2014,4th Edition.	
2	ReemaThareja,–DataStructuresUsingC‖,OxfordUniversitiesPress2014,2nd Edition	
ReferenceBooks		
1	ThomasH.Cormen,ChalesE.Leiserson,RonaldL.Rivest,CliffordStein,–Introduction to Algorithms‖,McGrawHill2009,3rdEdition	
2.	Aho,HopcroftandUllman,–DataStructuresandAlgorithms‖,PearsonEducation2003	
WebResources		
1.	NPTEL&MOOCcoursestitledDataStructures	
2.	https://nptel.ac.in/courses/106106127/	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**3**	**3**	**2**	**1**	**-**
CO2	**1**	**2**	**1**	**-**	**-**	**2**
CO3	**3**	**1**	**2**	**1**	**-**	**-**
CO4	**2**	**2**	**1**	**2**	**3**	**1**
CO5	**3**	**2**	**1**	**-**	**-**	**-**
Weightageofcoursecontributedtoeach PSO	12	10	8	5	4	4

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

SEMESTERIV

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
CC7	**ProgrammingINJAVA**	Core	5	-	-	-	4	5	25	75	100

CourseObjectives	
LO1	Toprovidefundamentalknowledgeofobject-orientedprogramming
LO2	ToequipthestudentwithprogrammingknowledgeinCoreJavafromthebasicsup.
LO3	ToenablethestudentstouseAWTcontrols,EventHandlingandSwingforGUI.
LO4	Toprovidefundamentalknowledgeofobject-orientedprogramming.
LO5	ToequipthestudentwithprogrammingknowledgeinCoreJavafromthebasicsup.

UNIT	Details	No. ofHours
I	**Introduction:**ReviewofObjectOrientedconcepts-HistoryofJava-Javabuzzwords-JVMarchitecture-Datatypes-Variables-Scopeandlifetimeofvariables-arrays-operators-controlstatements-typeconversionandcasting-simplejavaprogram-constructors-methods-Staticblock-StaticData-StaticMethodStringandStringBufferClasses.	15
II	**Inheritance**:Basic concepts - Types of inheritance - Member access rules- Usage of this and Super keyword-MethodOverloading-Methodoverriding-Abstract classes - Dynamic method dispatch - Usage offinalkeyword. **Packages**:Definition-AccessProtection - ImportingPackages. **Interfaces**:Definition–Implementation–Extending	15

	Interfaces. **Exception Handling**: *try–catch- throw - throws–finally–* Built-inexceptions- Creatingown Exceptionclasses.	
III	**MultithreadedProgramming**:ThreadClass-Runnableinterface–Synchronization–Usingsynchronizedmethods– Using synchronized statement-InterthreadCommunication–Deadlock. **I/OStreams:**Conceptsofstreams-Streamclasses-ByteandCharacterstream-ReadingconsoleInputandWritingConsoleoutput-FileHandling.	15
IV	**AWTControls:**TheAWTclasshierarchy-userinterfacecomponents-Labels-Button-TextComponents - Check Box - Check Box Group - Choice -List Box - Panels – Scroll Pane - Menu - Scroll Bar.Working with Frame class - Colour - Fonts and layoutmanagers. **EventHandling:**Events-Eventsources-EventListeners - Event Delegation Model (EDM) - HandlingMouse and Keyboard Events - Adapter classes - Innerclasses	15
V	**Swing:**IntroductiontoSwing-Hierarchyofswingcomponents.Containers-Toplevelcontainers-JFrame-JWindow - JDialog - JPanel - JButton - JToggleButton -JCheckBox-JRadioButton-JLabel,JTextField-JTextArea-JList-JComboBox-JScrollPane.	15
	Total	**75**

CourseOutcomes		
CourseOutcomes	Oncompletionofthiscourse, studentswill;	
CO1	Understand the basic Object-orientedconcepts.ImplementthebasicconstructsofCoreJava.	PO1,PO2,PO6
CO2	Implement inheritance, packages, interfaces and exceptionhandlingofCoreJava.	PO2,PO3,PO8

CO3	Implement multi-threadingandI/OStreamsofCoreJava	PO1,PO3,PO7
CO4	ImplementAWTandEventhandling.	PO2,PO6
CO5	UseSwingtocreateGUI.	PO1,PO3,PO8
TextBooks:		
1.	HerbertSchildt,The CompleteReference,TataMcGraw Hill,New Delhi,7thEdition,2010	
2.	GaryCornell,*CoreJava2VolumeI–Fundamentals,*AddisonWesley,1999	
References:		
1.	HeadFirstJava,O'RiellyPublications,	
2.	Y.DanielLiang,*IntroductiontoJavaProgramming*,7thEdition,PearsonEducationIndia,2010	
WebResources		
1.	https://javabeginnerstutorial.com/core-java-tutorial	
2.	http://docs.oracle.com/javase/tutorial/	
3.	https://www.coursera.org/	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**2**	**-**	**2**	**2**	**2**
CO2	**3**	**1**	**2**	**1**	**2**	**2**
CO3	**1**	**-**	**2**	**2**	**2**	**2**
CO4	**2**	**2**	**2**	**2**	**2**	**2**
CO5	**1**	**2**	**-**	**2**	**2**	**2**
Weightageofcourse contributedtoeach PSO	10	7	6	9	10	10

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
CC8	**Programminginjavalab**	Core	-	-	4	-	4	4	25	75	100
CourseObjective											
LO1	Toprovidefundamentalknowledgeofobject-orientedprogramming.										
LO2	Toequipthestudentwithprogrammingknowledgein CoreJavafromthebasicsup.										
LO3	ToenablethestudentstoknowaboutEventHandling.										
LO4	Toenablethe studentstouseStringConcepts.										
LO5	Toequipthestudentwithprogrammingknowledgeintocreat GUIusingAWTcontrols.										
UNIT	**Details**										
1	Writea Javaprogramthatpromptstheuserforanintegerandthen prints outalltheprimenumbersuptothatInteger										
2	WriteaJavaprogramtomultiplytwogivenmatrices.										
3	WriteaJavaprogramthatdisplaysthenumberofcharacters,linesandwordsin atext										
4	Generaterandomnumbersbetweentwogivenlimitsusing Randomclassandprint messagesaccordingtotherangeofthevaluegenerated.										
5	WriteaprogramtodoStringManipulationusingCharacterArrayandperform thefollowingstringoperations: a. Stringlength b. Findingacharacterataparticularposition c. Concatenatingtwostrings										
6	Writeaprogramtoperformthefollowingstringoperationsusing Stringclass:										

	a. StringConcatenation b. Searchasubstring c. Toextractsubstringfromgivenstring	
7	Writeaprogramtoperformstringoperationsusing StringBufferclass: a. Lengthofa string b. Reverseastring c. Deleteasubstringfromthegivenstring	
8	Write a java program that implements a multi-thread application thathasthreethreads.Firstthreadgeneratesrandomintegerevery1 secondand if the value is even, second thread computes the square of thenumber and prints. If the value is odd, the third thread will print thevalueofcubeofthenumber.	
9	Write a threading program which uses the same methodasynchronouslytoprintthenumbers1to10usingThread1andtoprint90to100 usingThread2.	
10	Writeaprogramtodemonstratetheuseoffollowingexceptions. a. ArithmeticException b. NumberFormatException c. ArrayIndexOutofBoundException d. NegativeArraySizeException	
11	Write a Java program that reads on file name from the user, thendisplays information about whether the file exists, whether the file isreadable,whetherthefileiswritable,thetypeoffileandthelengthofthefilein bytes	
12	Writea programtoaccepta textandchangeitssizeandfont.Includebolditalicoptions.Useframesandc	

	ontrols.	

13	Write a Java program that handles all mouse events and shows theeventnameatthecenterofthewindowwhenamouseeventisfired.(Usead apterclasses).	
14	Write a Java program that works as a simple calculator. Use a gridlayouttoarrangebuttonsforthedigitsandforthe+,-,*,%operations.Add a text field to display the result. Handle any possible exceptionslikedivideby zero.	
15	WriteaJavaprogramthatsimulatesatrafficlight.Theprogramletstheuser select one of three lights: red, yellow, or green with radio buttons.Onselectingabutton,anappropriatemessagewith−stop‖or−ready‖or −go‖shouldappearabovethebuttonsinaselectedcolor.Initiallythere isno messageshown.	
	Total	**60**

CourseOutcomes		**ProgrammeOutcome**
CO	Oncompletionofthiscourse,studentswill	
1	Understand the basic Object-orientedconcepts.Implementthebasicconstructs of CoreJava.	PO1
2	Implement inheritance, packages, interfaces and exceptionhandlingofCoreJava.	PO1,PO2
3	ImplementmultI-threadingandI/OStreamsofCore Java	PO4,PO6
4	ImplementAWTandEventhandling.	PO4,PO5,PO6
5	UseSwingtocreateGUI.	PO3,PO8

TextBook	
1	HerbertSchildt,The Complete Reference,TataMcGrawHill,NewDelhi,7thEdition,2010.
2.	GaryCornell,*CoreJava2VolumeI– Fundamentals,*AddisonWesley,1999.
ReferenceBooks	
1.	HeadFirstJava,O'RiellyPublications,

2.	Y.DanielLiang,*IntroductiontoJavaProgramming*,7thEdition,PearsonEducationIndia,2010.
WebResources	
1.	https://www.w3schools.com/java/
2.	http://java.sun.com
3.	http://www.afu.com/javafaq.html

MappingwithProgrammeOutcomes:

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

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

THIRDYEARS

EMESTERV

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
CC9	**OperatingSystems**	Core	5	-	-	-	4	5	25	75	100
CourseObjective											
LO1	UnderstandingthedesignoftheOperatingSystem										
LO2	ImpartingknowledgeonCPUscheduling,ProcessandMemoryManagement.										
LO3	Tocodespecializedprogramsformanagingoverallresourcesandoperationsofthecomputer.										
LO4	TostudyabouttheconceptofJobandprocessorscheduling										
LO5	Tolearnaboutteconceptofmemoryorganizationandmultiprogramming										
UNIT	**Details**							**No.of Hours**			
	Introduction:operatingsystem,history(1990sto2000andbeyond),distributedcomputing,parallelcomputation. **Processconcepts:**definitionofprocess,processstates-Lifecycleofaprocess,processmanagement-processstatetransitions,processcontrol block(PCB), process operations , suspend andresume,contextswitching,Interrupts-Interruptprocessing,interruptclasses,Interprocesscommunication-signals,messagepassing.							15			
II	**Asynchronousconcurrentprocesses:**mutualexclusion-critical section, mutual exclusion primitives,implementing mutual exclusion primitives, Peterson'salgorithm,software solutions to the mutual ExclusionProblem-,n-threadmutualexclusion-LamportsBakery Algorithm.Semaphores–							15			

	MutualexclusionwithSemaphores,threadsynchronizationwithsemaphores,	

	countingsemaphores,implementingsemaphores. **Concurrent programming:** monitors, messagepassing	
III	**Deadlockandindefinitepostponement:**Resourceconcepts,fournecessaryconditionsfordeadlock,deadlockprevention,deadlockavoidanceandDijkstra'sBanker'salgorithm,deadlockdetection,deadlockrecovery.	15
IV	**Jobandprocessorscheduling:**schedulinglevels,scheduling objectives, scheduling criteria, preemptivevsnon-preemptivescheduling,intervaltimerorinterruptingclock,priorities,schedulingalgorithms-FIFO scheduling, RR scheduling, quantum size, SJFscheduling,SRTscheduling,HRNscheduling,multilevelfeedbackqueues,Fairsharescheduling.	15
V	**RealMemoryorganizationandManagement::**Memory organization, Memory management, Memoryhierarchy, Memory management strategies, contiguousvsnon-contiguousmemoryallocation,singleusercontiguousmemoryallocation,fixedpartitionmultiprogramming, variable partitionmultiprogramming, Memoryswapping **Virtual Memory organization:** virtual memory basicconcepts,multilevelstorageorganization, block mapping, paging basic concepts, segmentation,paging/segmentationsystems. **VirtualMemoryManagement:**Demand Paging,Pagereplacementstrategies	15
	Total	**75**

CourseOutcomes		**ProgrammeOutcomes**
CO	Oncompletionofthiscourse, studentswill	

1	Define the fundamentals of OS and identifytheconceptsrelevanttoprocess,processlifecycle,Scheduling Algorithms, Deadlock and Memorymanagement	PO1
2	knowthecriticalanalysisofprocessinvolvingvarious algorithms, an exposure to threads andsemaphores	PO1,PO2
3	Have a complete study about Deadlock and itsimpact over OS. Knowledge of handling Deadlockwithrespective algorithms andmeasuresto retrievefromdeadlock..	PO4,PO6
4	HavecompleteknowledgeofSchedulingAlgorithmsanditstypes.	PO4,PO5,PO6
5	understandmemoryorganizationandmanagement	PO3,PO8
TextBook		
1	H.M.Deitel,OperatingSystems,ThirdEdition,PearsonEducationAsia,2011	
ReferenceBooks		
1.	WilliamStallings,OperatingSystem:InternalsandDesign Principles,SeventhEdition, Prentice-HallofIndia,2012.	
2.	A.Silberschatz, and P.B. Galvin.,OperatingSystems Concepts, Nineth Edition, JohnWiley&Sons(ASIA)PteLtd.,2012	
WebResources		
1.		
2.		

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**-**	**1**	**2**	**-**	**1**
CO2	**2**	**3**	**1**	**2**	**-**	**1**
CO3	**3**	**2**	**-**	**3**	**-**	**1**
CO4	**1**	**3**	**1**	**1**	**3**	**2**
CO5	**3**	**-**	**1**	**3**	**2**	**1**
Weightageofcoursecontributedtoeach PSO	12	8	4	11	5	6

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
CC10	**ASP.Net Programming**	Core	5	-	-	-	4	5	25	75	100

CourseObjective	
LO1	To identify andunderstandthe goals andobjectives of the .NETframeworkandASP.NETwithC#language.
LO2	TodevelopASP.NETWebapplicationusingstandardcontrols.
LO3	Toimplementfilehandlingoperations.
LO4	TohandlesSQLServerDatabaseusingADO.NET.
LO5	UnderstandtheGridviewcontrolandXMLclasses.

UNIT	Details	No. ofHours
I	Overviewof.NETframework:CommonLanguageRuntime(CLR),FrameworkClassLibrary-C#Fundamentals: Primitive types and Variables – Operators -Conditionalstatements-Loopingstatements –Creatingand usingObjects–Arrays–Stringoperations.	15
II	IntroductiontoASP.NET-IDE-LanguagessupportedComponents-WorkingwithWebForms–Webformstandardcontrols:Propertiesanditsevents–HTML controls-ListControls:Propertiesanditsevents.	15
III	RichControls:Propertiesanditsevents–validationcontrols: Properties and its events– File Stream classes -File Modes – File Share – Reading and Writing to files –Creating, Moving,Copying andDeletingfiles –Fileuploading.	15
IV	ADO.NETOverview–DatabaseConnections–Commands –DataReader-DataAdapter-DataSets-DataControlsand	15

	itsProperties–DataBinding	
V	Grid View control: Deleting, editing, Sorting and Paging.XMLclasses–WebformtomanipulateXMLfiles-WebsiteSecurity-Authentication-Authorization–CreatingaWebapplication.	15
	Total	**75**

CourseOutcomes		**ProgrammeOutcome**
CO	Oncompletionofthiscourse, studentswill	
1	DevelopworkingknowledgeofC#programmingconstructsandthe.NETFramework	PO1,PO2,PO6
2	Todevelopa softwaretosolvereal-worldproblemsusingASP.NET	PO2,PO3,PO8
3	ToWorkOn VariousControlsFiles	PO1,PO3,PO7
4	TocreateawebapplicationusingMicrosoftADO.NET.	PO2,PO6
5	TodevelopwebapplicationsusingXML	PO1,PO3,PO8

TextBook

1	SvetlinNakov,VeselinKolev&Co,FundamentalsofComputerProgrammingwithC#,Faberpublication,2019.
2	Mathew,MacDonald,TheCompleteReferenceASP.NET,TataMcGraw-Hill,2015.

ReferenceBooks

1.	HerbertSchildt,TheCompleteReferenceC#.NET,TataMcGraw-Hill,2017.
2.	KogentLearningSolutions,C#2012ProgrammingCovers .NET4.5BlackBook,Dreamtechpres,2013.
3.	AnneBoehm,JoelMurach,Murach'sC#2015,MikeMurach&AssociatesInc.2016.
4.	DenielleOtey,MichaelOtey,ADO.NET:TheCompletereference,McGrawHill,2008.
5.	MatthewMacDonald,BeginningASP.NET4inC#2010,APRESS,2010.

WebResources

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

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**1**	**2**	**2**	**1**	3
CO2	**3**	**2**	**2**	**2**	**2**	3
CO3	**3**	**3**	**2**	**2**	**3**	3
CO4	**3**	**1**	**2**	**2**	**1**	3
CO5	**3**	**1**	**2**	**2**	**1**	2
Weightageofcoursecontributedtoeach PSO	15	8	10	10	8	14

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

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

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

MappingwithProgrammeOutcomes:

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

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

SEMESTERVI

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
CC13	**ComputerNetworks**	CORE/ Elective	5	-	-	-	4	5	25	75	100

CourseObjective	
LO1	TounderstandtheconceptofDatacommunicationandComputernetwork
LO2	Togetaknowledge onroutingalgorithms.
LO3	Toimpart knowledge about networkingandinter networking devices
LO4	Tostudy aboutNetwork communication.
LO5	TolearntheconceptofTransportlayer

UNIT	**Details**	**No.of Hours**
I	Introduction–NetworkHardware–Software–ReferenceModels–OSIand TCP/IP Models – Example Networks: Internet, ATM, Ethernet andWirelessLANs-PhysicalLayer–TheoreticalBasisforData Communication-GuidedTransmissionMedia	15
II	WirelessTransmission-CommunicationSatellites– TelephoneSystem:Structure,LocalLoop,TrunksandMultiplexingandSwitching.Data LinkLayer:DesignIssues–ErrorDetectionandCorrection.	15
III	Elementary Data Link Protocols - Sliding Window Protocols – DataLink Layer in the Internet - Medium Access Layer – Channel AllocationProblem–MultipleAccessProtocols–Bluetooth	15
IV	NetworkLayer-DesignIssues-RoutingAlgorithms-CongestionControlAlgorithms–IPProtocol–IPAddresses–InternetControl Protocols.	15
V	TransportLayer-Services-ConnectionManagement-Addressing, EstablishingandReleasingaConnection–SimpleTransportProtocol– InternetTransporetProtocols(ITP)-NetworkSecurity:Cryptography.	15
	Total	**75**

CourseOutcomes		**ProgrammeOutcome**
CO	Oncompletionofthiscourse,studentswill	
1	ToUnderstand the basics of Computer Network architecture,OSIandTCP/IPreference model	PO1

2	Togain knowledge on Telephone systems using wirelessnetwork	PO1,PO2
3	TounderstandtheconceptofMAC	PO4,PO6
4	Toanalyze the characteristics of Routing and Congestioncontrolalgorithms	PO4,PO5,PO6
5	Tounderstandnetworksecurityanddefinevarious protocolssuchasFTP,HTTP,Telnet,DNS	PO3,PO8
TextBook		
1	A.S.Tanenbaum,–ComputerNetworks‖,4th Edition,Prentice-HallofIndia,2008.	
ReferenceBooks		
1.	B.A.Forouzan,–DataCommunicationsandNetworking‖,TataMcGrawHill,4th Edition,2017	
2.	F. Halsall, –DataCommunications, ComputerNetworksandOpen Systems‖,PearsonEducation,2008	
3.	D.BertsekasandR.Gallagher,–DataNetworks‖,2ndEdition,PHI,2008.	
4.	Lamarca,–CommunicationNetworks‖,TataMcGraw-Hill,2002	
WebResources		
1.	https://en.wikipedia.org/wiki/Computer_network	
2.	https://citationsy.com/styles/computer-networks	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**2**	**-**	**2**	**1**	**-**
CO2	**3**	**2**	**1**	**2**	**2**	**-**
CO3	**3**	**-**	**-**	**2**	**-**	**2**
CO4	**3**	**1**	**-**	**2**	**1**	**-**
CO5	**3**	**3**	**-**	**2**	**1**	**-**
Weightageofcourse contributedtoeach PSO	15	8	1	10	5	2

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
CC14	DATAANALYTICS USINGRProgramming	Core	6	-	-	-	4	6	25	75	100
CourseObjective											
LO1	Tounderstandtheproblemsolvingapproaches										
LO2	TolearnthebasicprogrammingconstructsinRProgramming										
LO3	TolearnthebasicprogrammingconstructsinRProgramming										
LO4	TouseRProgrammingdata structures-lists,tuples,anddictionaries.										
LO5	Todoinput/outputwithfilesinRProgramming.										

UNIT	Details	No.of Hours
I	Evolution of Big data — Best Practices for Big dataAnalytics — Big data characteristics — Validating —The Promotion of the Value of Big Data — Big DataUse Cases- Characteristics of Big Data Applications —Perception and Quantification of Value -UnderstandingBig Data Storage —A General Overview of High-PerformanceArchitecture— HDFS— MapReduceandYARN— MapReduceProgrammingModel	18
II	CONTROLSTRUCTURESANDVECTORS-Control structures,functions, scoping rules, dates and times,Introduction to Functions, preview of Some ImportantRDataStructures,Vectors,CharacterStrings,Matrices,Lists,DataFrames,ClassesVectors:Generatingsequences,Vectorsandsubscripts,Extractingelementsofavectorusingsubscripts,Workingwithlogicalsubscripts,Scalars,Vectors,Arrays,andMatrices,AddingandDeletingVectorElements,ObtainingtheLengthofaVector,MatricesandArraysasVectorsVectorArithmeticandLogical	18

	Operations, Vector Indexing, Common VectorOperations	
III	LISTS- Lists: Creating Lists, General List Operations,ListIndexingAddingandDeletingListElements,Getting the Size of a List, Extended Example: TextConcordance Accessing List Components and ValuesApplyingFunctions to Lists, DataFrames, CreatingData Frames, Accessing Data Frames, Other Matrix-LikeOperations	18
IV	FACTORSANDTABLES-FactorsandLevels,Common Functions Used with Factors, Working withTables,Matrix/Array-LikeOperationsonTables,Extracting a Sub table, Finding the Largest Cells in aTable,MathFunctions,CalculatingaProbability,Cumulative Sums and Products, Minima and Maxima,Calculus,FunctionsforStatisticalDistributions RPROGRAMMING.	18
V	OBJECT-ORIENTEDPROGRAMMINGSClasses,SGenericFunctions,WritingSClasses,UsingInheritance,SClasses,WritingSClasses,ImplementingaGenericFunctiononanSClass,visualization,Simulation,codeprofiling,StatisticalAnalysiswithR,datamanipulation	18
	Total	**90**

CourseOutcomes		**ProgrammeOutcomes**
CO	Oncompletionofthiscourse, studentswill	
1	Work withbigdatatoolsanditsanalysistechniques.	PO1
2	Analyzedatabyutilizingclusteringandclassificationalgorithms.	PO1,PO2

3	Learnandapplydifferentminingalgorithmsandrecommendationsystemsforlargevolumesofdata.	PO4,PO6
4	Performanalyticsondatastreams.	PO4,PO5,PO6
5	LearnNoSQLdatabasesandmanagement.	PO3,PO8
TextBook		
1	RogerD.Peng,‖RProgrammingforDataScience–,2012	
2	NormanMatloff,‖TheArtofRProgramming-ATourofStatisticalSoftware Design‖, 2011	
ReferenceBooks		
1.	1.GarrettGrolemund,HadleyWickham,‖Hands-OnProgrammingwithR:WriteYourOwnFunctionsand Simulations‖, 1stEdition,2014	
2.	Venables,W.N.,andRipley,‖Sprogramming–,Springer,2000.	
WebResources		
1.	https://www.simplilearn.com	

MappingwithProgrammeOutcomes:

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

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
CC15	**RProgramming-LAB**	Core	-	-	5	-	4	5	25	75	100

CourseObjective	
LO1	Tounderstandtheproblemsolvingapproaches
LO2	TolearnthebasicprogrammingconstructsinRProgramming
LO3	TopracticevariouscomputingstrategiesforRProgramming-basedsolutionstorealworldproblems
LO4	TouseRProgrammingdata structures-lists,tuples,anddictionaries.
LO5	Todoinput/outputwithfilesinRProgramming.

Sl.No	**Details**	
1.	Programtoconvertthegiventemperaturefrom FahrenheittoCelsiusandvice versadepending uponuser‘schoice.	
2.	Program,to find the areaof rectangle,square,circle and triangle byacceptingsuitableinput parametersfromuser.	
3.	Writeaprogramtofindlist ofevennumbersfrom1tonusingR-Loops.	
4.	Createa functiontoprintsquaresofnumbersinsequence.	
5.	Writeaprogramtojoincolumnsandrowsinadata frameusingcbind()andrbind()in R.	
6.	ImplementdifferentStringManipulationfunctionsinR.	
7.	ImplementdifferentdatastructuresinR(Vectors,Lists,DataFrames)	

8	Writeaprogramtoreadacsvfileandanalyzethedatainthefileinr.	
9	CreatepiechartandbarchartusingR.	
10	10.Createadata setanddostatisticalanalysisonthedatausingR.	
11	Programtofindfactorialofthegivennumberusingrecursivefunction	
12	**WriteaRprogramtocountthenumberofevenandoddnumbersfroma rray ofNnumbers.**	
	Total	

CourseOutcomes		**ProgrameOutcome**
CO	Oncompletionofthiscourse, studentswill	
1	AcquireprogrammingskillsincoreR Programming	PO1,PO4,PO5
2	AcquireObject-orientedprogrammingskills inRProgramming.	PO1,PO4,PO8
3	Developtheskillofdesigninggraphical-user interfaces(GUI)inRProgramming	PO1,PO3,PO6
4	AcquireRProgrammingskillstomoveinto specificbranches	PO3,PO4
5		PO1,PO5,PO6

TextBook	
1	RogerD.Peng,‖RProgrammingforDataScience–,2012
2	NormanMatloff,‖TheArtofRProgramming-A TourofStatisticalSoftwareDesign‖, 2011
ReferenceBooks	
1	GarrettGrolemund,Hadley Wickham,‖Hands-OnProgrammingwith R:Write YourOwn Functionsand Simulations‖,1stEdition,2014
2.	Venables,W.N.,andRipley,‖Sprogramming–,Springer,2000.
WebResources	
1.	https://www.simplilearn.com

MappingwithProgrammeOutcomes:

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

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

Annexure - I

SuggestedtopicsinCorecomponent

1. MicroprocessorandMicrocontroller
2. MicroprocessorandMicrocontrollerLab
3. RDBMSwithPL/SQL
4. PL/SQLLab
5. SoftwareEngineering
6. MachineLearning
7. MachineLearningLab
8. NetworkSecurity
9. DataMiningandWarehousing
10. MobileApplicationDevelopment
11. MobileApplicationDevelopmentLab
12. IntroductiontoDataScienceandmore..

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	MicroprocessorandMicrocontroller		5	-	-	-	4	5	25	75	100
CourseObjective											
LO1	Tointroducetheinternalorganizationof Intel8085Microprocessor.										
LO2	Toknowaboutvariousinstructionsetsandclassifictions										
LO3	Toenablethe studentstowriteassemblylanguageprogramsusing8085.										
LO4	TointerfacetheperipheraldevicesTo8085usingInterrruptcontrollerandDMAinterface.										
LO5	Toprovidereal-lifeapplicationsusingmicrocontroller.										
UNIT	**Details**										**No.of Hours**

I	DigitalComputers-MicrocomputerOrganization-Computerlanguages –MicroprocessorArchitectureanditsoperations–Microprocessorinitiated operations and 8085 Bus organization – Internal Data operations and 8085 registers - Peripheral or External initiated	15
	operations.	
II	8085Microprocessor–PinoutandSignals–Functionalblockdiagram -8085InstructionSetandClassifications.	15
III	BCD to Binary and Binary to BCD conversions - ASCII to BCD andBCD to ASCII conversions - Binary to ASCII and ASCII to Binaryconversions.BCDArithmetic-BCDadditionandSubtraction-MultibyteAdditionandSubtraction-MultiplicationandDivision.	15
IV	The8085Interrupts –RIMANDSIM instructions-8259Programmable InterruptController-DirectMemoryAccess(DMA)and8257DMAcontroller.	15
V	Introduction to Microcontroller - Microcontroller Vs Microprocessor - 8051 Microcontroller architecture -8051 pin description.Timers andCounters–OperatingModes-ControlRegisters.Interrupts–Interrupts in8051-InterruptsControlRegister–Executionofinterrupt.	15
	Total	**75**

CourseOutcomes		**ProgrammemeOutcomea**
CO	Oncompletionofthiscourse, studentswill	
1	RemembertheBasicbinarycodesandtheirconversions.Binary concepts are used inMicroprocessorprogramming and provide a good understanding of thearchitectureof8085ointroducetheinternalorganization ofIntel8085Microprocessor..	Po1
2	Understanding the8085instruction set and theirclassifications,enablesthe studentstowritethe programs easilyontheir ownusingdifferentlogic	Po1,Po2

3	Applying different types of instructions to convert binarycodes and analyzing the outcome. The instruction set isappliedtodevelopprogramsonmultibytearithmetic operations.	Po4,Po6
4	Analyzehowperipheraldevicesareconnectedto8085 usingInterruptsandDMAcontroller.	Po4,Po5,Po6
5	Anexposuretocreaterealtimeapplicationsusing	Po3,Po8
	microcontroller.	
TextBook		
1	R.S.Gaonkar-"MicroprocessorArchitecture-ProgrammingandApplicationswith 8085"-5thEdition-PenramInternationalPublications,2009.[ForunitItounitIV]	
2	SoumitraKumarMandal--MicroprocessorsandMicrocontrollers–Architectures, ProgrammingandInterfacingusing8085,8086,8051‖,TataMcGrawHillEducation PrivateLimited.[forunitV].	
ReferenceBooks		
1.	Mathur--IntroductiontoMicroprocessor‖-3rdEdition-TataMcGraw-Hill-1993.	
2.	RajKamal--Microcontrollers:Architecture,Programming,InterfacingandSystem Design‖,PearsonEducation,2005.	
3.	KrishnaKant,-MicroprocessorsandMicrocontrollers–Architectures,Programming andSystemDesign8085,8086,8051,8096‖,PHI,2008	
WebResources		
1.	WebresourcesfromNDLLibrary,E-contentfromopensourcelibraries	
2.	https://www.bing.com/	

MappingwithProgrammeOutcomes:

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

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	Microprocessor andmicrocontrollerLab		-	-	4	-	4	4	25	75	100
CourseObjective											
LO1	TointroducetheinternalorganizationofIntel8085Microprocessor.										
LO2	Toknowaboutvariousinstructionsetsandclassifictions										
LO3	Toenablethe studentstowriteassemblylanguageprogramsusing8085.										
LO4	TointerfacetheperipheraldevicesTo8085usingInterrruptcontrollerandDMAinterface.										
LO5	Toprovidereal-lifeapplicationsusingmicrocontroller.										
	Details										**No. ofHours**
	ListofExercises:										
	AdditionandSubtraction 1. 8-bitaddition 2. 16-bitaddition 3. 8-bitsubtraction 4. BCDsubtraction II. MultiplicationandDivision 1. 8-bitmultiplication 2. BCDmultiplication 3. 8-bitdivision III. SortingandSearching 1. Searchingforanelementinanarray. 2. SortinginAscendingandDescendingorder. 3. Findingthelargestandsmallestelementsinanarray. 4. Reversingarrayelements. 5. Blockmove.										

	IV. CodeConversion 1. BCDtoHexandHextoBCD 2. BinarytoASCIIandASCIItobinary 3. ASCIItoBCDandBCDtoASCII V. Simpleprogramson8051Microcontroller 1. Addition 2. Subtraction 3. Multiplication 4. Division 5. InterfacingExperimentsusing8051 I. RealisationofBooleanExpressionthroughports. II. Timedelaygenerationusingsubroutines. III. DisplayLEDsthroughports	
	Total	**60**

CourseOutcomes		**ProgrammemeOutcomea**
CO	Oncompletionofthiscourse, studentswill	
1	RemembertheBasicbinarycodesandtheirconversions.Binary concepts are used inMicroprocessorprogramming and provide a good understanding of thearchitectureof8085ointroducetheinternalorganization ofIntel8085Microprocessor..	Po1
2	Understandingthe8085instructionsetandtheir classifications,enablesthestudentstowritetheprogramseasilyon their ownusingdifferentlogic	Po1,Po2
3	Applying different types of instructions to convert binarycodes and analyzing the outcome. The instruction set isappliedtodevelopprogramsonmultibytearithmetic operations.	Po4,Po6
4	Analyzehowperipheraldevicesare connectedto8085 usingInterruptsandDMAcontroller.	Po4,Po5,Po6
5	Anexposuretocreaterealtimeapplicationsusing	Po3,Po8

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

MappingwithProgrammeOutcomes:

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

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	RDBMSwithPL\SQL	Core	5	-	-	-	4	5	25	75	100

CourseObjective	
LO1	Describebasicconceptsofdatabasesystem
LO2	DesignaData modelandSchemasinRDBMS
LO3	CompetentinuseofSQL
LO4	AnalyzefunctionaldependenciesfordesigningrobustDatabase
LO5	Describebasicconceptsofdatabasesystem

UNIT	**Details**	**No. ofHours**
I	UNIT -I Introduction to DBMS– Data and Information - Database – DatabaseManagementSystem–Objectives-Advantages–Components-Architecture. ER Model: Building blocks of ER Diagram – RelationshipDegree–Classification–ERdiagramtoTables– ISArelationship– Constraints–AggregationandComposition–Advantages	15
II	RelationalModel:CODD'sRule-RelationalDataModel-Key-Integrity–RelationalAlgebraOperations–Advantagesandlimitations–Relational Calculus– DomainRelationalCalculus - QBE.	15
III	Structure of Relational Database. Introduction to Relational DatabaseDesign-Objectives–Tools–RedundancyandDataAnomaly–FunctionalDependency-Normalization–1NF–2NF–3NF–BCNF. TransactionProcessing–Database Security.	15
IV	UNIT-IV SQL:Commands–Datatypes–DDL-Selection,Projection,JoinandSet Operations–AggregateFunctions–DML–Modification-Truncation-Constraints–Subquery.	15
V	UNIT -V PL/SQL:Structure-Elements–OperatorsPrecedence–ControlStructure–IterativeControl-Cursors-Procedure-Function-Packages–Exceptional Handling-Triggers.	15
	Total	**75**

CourseOutcomes		**ProgrammeOutcome**
CO	Oncompletionofthiscourse, studentswill	
1	Understandbasicconceptsofdatabasesystem	PO1
2	DesignaData modelandSchemasinRDBMS	PO1,PO2

3	UnderstandCompetentinuseofSQL	PO4,PO6

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

MappingwithProgrammeOutcomes:

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

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

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

	IV. APPLICATION 10. LIBRARYMANAGEMENTSYSTEM 11. STUDENTMARKANALYSIS	
	Total	60

CourseOutcomes		**ProgrammeOutcomes**
CO	Oncompletionofthiscourse, studentswill	
1	Understand thevarious basicconcepts of DataBaseSystem.DifferencebetweenfilesystemandDBMS andcomparevariousdatamodels.	PO1
2	Definetheintegrityconstraints.Understandthebasicconceptsof RelationalDataModel,Entity-RelationshipModel.	PO1,PO2
3	Design database schema considering normalizationand relationships within database. Understand andconstructdatabaseusingStructured Query Language.Attain a good practical skill of managing andretrievingofdatausingDataManipulationLanguage (DML)	PO4,PO6
4	Classifythedifferentfunctionsandvariousjoin operations andenhance the knowledgeofhandlingmultipletables.	PO4,PO5,PO6
5	LearntodesignDatabaseoperationsandimplementusing PL/SQL programs. Learn basics of PL/SQLanddevelopprogramsusingCursors,Exceptions	PO3,PO8

TextBook	
1	Coronel,Morris,Rob,"DatabaseSystems,Design, ImplementationandManagement", NinthEdition
2	NileshShah,"DatabaseSystemsUsingOracle",2ndedition,PearsonEducationIndia, 2016
ReferenceBooks	
1.	Abraham Silberschatz, Henry F.Korth and S.Sudarshan,–Database System Concepts‖,McGrawHillInternationalPublication,VIEdition
2.	ShioKumarSingh,–DatabaseSystems–,Pearsonpublications,IIEdition

WebResources	
1.	WebresourcesfromNDLLibrary,E-contentfromopen-sourcelibraries

MappingwithProgrammeOutcomes:

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

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	SoftwareEngineering	Core	5	-	-	-	4	5	25	75	100

CourseObjectives	
LO1	Gainbasicknowledgeofanalysisanddesignofsystems
LO2	Abilitytoapplysoftwareengineeringprinciplesandtechniques
LO3	Modelareliableandcost-effectivesoftwaresystem
LO4	Abilitytodesignaneffectivemodelofthesystem
LO5	PerformTestingatvariouslevelsandproduceanefficientsystem.

UNIT	Details	No. ofHours
I	**Introduction**:Thesoftwareengineeringdiscipline,programsvs.softwareproducts,whystudysoftwareengineering,emergenceofsoftwareengineering,Notablechangesinsoftwaredevelopmentpractices,computersystemsengineering. **SoftwareLifeCycleModels**:Whyusealifecyclemodel,Classicalwaterfallmodel,iterativewaterfallmodel,prototypingmodel,evolutionarymodel,spiralmodel,comparisonofdifferentlifecyclemodels.	15
II	**RequirementsAnalysisandSpecification:**Requirementsgatheringandanalysis,Softwarerequirementsspecification (SRS) **Software Design**: Good software design, cohesion andcoupling, neat arrangement, software design approaches,object-orientedvsfunction-orienteddesign	15

III	**Function-OrientedSoftwareDesign:**OverviewofSA/SDmethodology,structuredanalysis,dataflowdiagrams(DFD's),structureddesign,detaileddesign.**User-Interface design:** Characteristics of a goodinterface;basicconcepts;typesofuserinterfaces;componentbasedGUIdevelopment,auserinterfacemethodology.	15
IV	**CodingandTesting:**Coding;codereview;testing;testing in the large vs testing in the small; unit testing;black-boxtesting;white-boxtesting;debugging;programanalysis tools; integration testing; system testing; somegeneralissuesassociatedwithtesting.**SoftwareReliabilityandQualityManagement:**Softwarereliability; statistical testing; software quality; softwarequalitymanagementsystem;SEIcapabilitymaturitymodel; personalsoftwareprocess.	15
V	**ComputerAidedSoftwareEngineering:**CASEanditsscope; CASE environment; CASE support in softwarelife cycle; other characteristics of CASE tools; towardssecond generation CASE tool; architecture of a CASEenvironment. **Software Maintenance:** Characteristic ofsoftware maintenance; software reverseengineering;softwaremaintenanceprocessmodels; estimationofmaintenancecost;	15
	Total	**75**

CourseOutcomes		
CourseOutcomes	Oncompletionofthiscourse,studentswill;	
CO1	Gainbasicknowledgeofanalysisanddesignofsystems	PO1

CO2	Abilitytoapplysoftwareengineeringprinciplesand techniques	PO1,PO2
CO3	Modelareliableandcost-effectivesoftwaresystem	PO4,PO6
CO4	Abilitytodesignaneffectivemodelofthe system	PO4,PO5,PO6
CO5	PerformTestingatvariouslevelsandproduceanefficientsystem.	PO3,PO8
TextBooks		
1.	RajibMall, FundamentalsofSoftwareEngineering,FifthEdition,Prentice-HallofIndia,2018	
ReferencesBooks		
1.	RichardFairley,SoftwareEngineeringConcepts,TataMcGraw-Hill publishingcompanyLtd,Edition1997	
2.	RogerS.Pressman,SoftwareEngineering,SeventhEdition,McGraw-Hill.	
3.	JamesA.Senn,Analysis&Designof InformationSystems, SecondEdition, McGraw-HillInternationalEditions.	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**2**	**3**	**2**	**1**	**-**
CO2	**3**	**-**	**1**	**-**	**-**	**2**
CO3	**1**	**2**	**3**	**2**	**2**	**1**
CO4	**3**	**-**	**2**	**2**	**-**	**1**
CO5	**1**	**2**	**3**	**3**	**1**	**1**
Weightageofcourse contributedtoeach PSO	11	6	12	9	4	5

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

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

CourseOutcomes		Programme Outcomes
CO	Oncompletionofthiscourse, studentswill	

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

MappingwithProgrammeOutcomes:

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

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	MACHINELEARNING LAB		-	-	4	-	4	25	75	100

LearningObjectives:

ToapplytheconceptsofMachineLearningtosolvereal-worldproblemsandtoimplementbasicalgorithmsinclustering&classificationappliedtotext &numericdata

LABEXERCISES	Required Hour
1. SolvingRegression&ClassificationusingDecisionTrees 2. RootNodeAttributeSelectionforDecisionTreesusingInformationGain 3. BayesianInferenceinGeneExpressionAnalysis 4. PatternRecognitionApplicationusingBayesianInference 5. BagginginClassification 6. Bagging,BoostingapplicationsusingRegressionTrees 7. Data &TextClassificationusingNeuralNetworks 8. UsingWekatoolforSVMclassificationforchosendomainapplication 9. Data&TextClusteringusingK-meansalgorithm 10. Data&TextClusteringusingGaussianMixtureModels	**60**

CourseOutcomes	
CO	Oncompletionofthiscourse, studentswill
CO1	Effectivelyusethevariousmachinelearningtools

CO2	Understandandimplementtheproceduresformachinelearningalgorithms CO3
CO3	DesignPythonprogramsforvariousmachinelearningalgorithms
CO4	ApplyappropriatedatasetstotheMachineLearningalgorithms
CO5	Analyzethegraphicaloutcomesoflearningalgorithmswithspecificdatasets

MappingwithProgrammeOutcomes:

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

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	NetworkSecurity		5	-	-	-	4	5	25	75	100
CourseObjectives											
LO1	Tofamiliarizeonthemodelofnetworksecurity,Encryptiontechniques										
LO2	TounderstandtheconceptofNumberTheory,theorems										
LO3	Tounderstandthedesignconceptofcryptographyandauthentication										
LO4	Todevelopexperimentsonalgorithmusedforsecurity										
LO5	Tounderstandaboutvirusandthreats,firewalls,andimplementationofCryptography										

UNIT	Details	No. ofHours
I	Model of network security – Security attacks, servicesand attacks –OSI security architecture – Classicalencryptiontechniques–SDES– BlockcipherPrinciplesDES–StrengthofDES– Blockcipherdesignprinciples–Block cipher mode of operation –Evaluation criteria for AES – RC4 - Differential andlinearcryptanalysis– Placementofencryptionfunction –trafficconfidentiality.	15
II	NumberTheory–Primenumber–Modulararithmetic– Euclid‘salgorithm-Fermet‘sandEuler‘s theorem – Primality –Chineseremaindertheorem– Discretelogarithm–Publickeycryptography and RSA –Key distribution –Keymanagement– DiffieHellmankeyexchange– Ellipticcurvecryptography	15
III	Authenticationrequirement–Authenticationfunction– MAC–Hashfunction–Securityofhashfunctionand MAC–SHA-HMAC–CMAC-Digitalsignature	15

	andauthenticationprotocols–DSS.	
IV	Authentication applications – Kerberos – X.509Authenticationservices-E-mailsecurity–IPsecurity -Websecurity	15
V	Intruder – Intrusion detection system – Virus andrelatedthreats–Countermeasures– Firewallsdesignprinciples–Trustedsystems– Practicalimplementationofcryptographyandsecurity	15
	Total	**75**

CourseOutcomes		
CourseOutcomes	Oncompletionofthiscourse, studentswill;	
CO1	Analyzeanddesignclassical encryptiontechniquesand blockciphers.	PO1,PO3,PO6,PO8
CO2	Understand and analyze public-key cryptography, RSAandotherpublic-keycryptosystemssuchasDiffie-HellmanKeyExchange,ElGamalCryptosystem,etc	PO1,PO2,PO3,PO6
CO3	Understandkeymanagementanddistributionschemesanddesign User Authentication	PO3,PO5
CO4	AnalyzeanddesignhashandMACalgorithms,anddigitalsignatures.	PO1,PO2,PO3,PO7
CO5	Know about Intruders and Intruder Detection mechanisms,TypesofMalicioussoftware,	P02,PO6,PO7

ReferenceText:	
1.	WilliamStallings,–Cryptography&NetworkSecurity‖,PearsonEducation, FourthEdition2010.

References:	
1.	CharlieKaufman,RadiaPerlman,MikeSpeciner,–NetworkSecurity,Privatecommunicationinpublicworld‖,PHISecondEdition,2002
2.	BruceSchneier,NeilsFerguson,–PracticalCryptography‖,WileyDreamtechIndiaPvt Ltd,FirstEdition,2003.
3.	DouglasRSimson–Cryptography–Theoryandpractice‖,CRCPress,FirstEdition,1995

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

MappingwithProgrammeOutcomes:

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

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	Data Mining And Warehousing		5	-	-	-	4	5	25	75	100

CourseObjectives	
LO1	ToprovidetheknowledgeonDataMiningandWarehousingconceptsandtechniques
LO2	TostudythebasicconceptsofDataMining,ArchitectureandComparison.
LO3	TostudyasetofMiningAssociationRules,DataWarehouses.
LO4	TostudyaboutClassificationandPrediction,ClassifierAccuracy
LO5	Tostudythebasicconceptsofclusteranalysis,ClusterMethods

UNIT	Details	No. ofHours	CourseObjectives
I	*Introduction:Datamining–Functionalities–Classification–IntroductiontoDataWarehousing–DataPreprocessing:PreprocessingtheData–Datacleaning–DataIntegrationandTransformation–Data Reduction*	15	CO1
II	DataMining,Primitives,LanguagesandSystemArchitecture:DataMining–Primitives–DataMiningQueryLanguage,ArchitectureofDataminingSystems. Concept Description, Characterization andComparison:ConceptDescription,DataGeneralizationandSummarization,AnalyticalCharacterization,MiningClassComparison–StatisticalMeasures.	15	CO2
III	MiningAssociationRules:BasicConcepts–SingleDimensionalBooleanAssociationRulesFromTransactionDatabases,MultilevelAssociationRulesfrom transaction databases – Multi dimension AssociationRulesfromRelationalDatabaseandData	15	CO3

	Warehouses.		
IV	ClassificationandPrediction:Introduction–Issues–DecisionTreeInduction–BayesianClassification–Classification of Back Propagation. Classification basedon ConceptsfromAssociationRuleMining–OtherMethods.Prediction–Introduction–ClassifierAccuracy	15	CO4
V	Cluster Analysis: Introduction – Types of DatainClusterAnalysis,PetitioningMethods–HierarchicalMethods-DensityBasedMethods–GRIDBasedMethod–ModelbasedClusteringMethod	15	CO5
	Total	**75**	

CourseOutcomes		
CourseOutcomes	Oncompletionofthiscourse,studentswill;	
CO1	Tounderstand thebasicconceptsand thefunctionality of thevariousdataminganddatawarehousingcomponent	PO1,PO3,PO6,PO8
CO2	To know the concepts of Data mining system architectures	PO1,PO2,PO3,PO6
CO3	Toanalyzetheprinciplesofassociationrules	PO3,PO5
CO4	TogetanalyticalideaonClassificationandpredictionmethods	PO1,PO2,PO3,PO7
CO5	ToGainknowledgeonClusteranalysisanditsmethods.	PO2,PO6,PO7

TextBooks

(LatestEditions)

1.	HanandM.Kamber,‐DataMiningConceptsandTechniques‖,2001,Harcourt IndiaPvt.Ltd,NewDelhi.

ReferencesBooks

(Latesteditions)

1.	K.P.Soman,ShyamDiwakar,V.Ajay‐InsightintoDataMiningTheoryand Practice‐,PrenticeHallofIndiaPvt.Ltd,NewDelhi

2.	ParteekBhatia,_DataMiningandDataWarehousing:PrinciplesandPracticalTechniques‘, CambridgeUniversity Press,2019
WebResources	
1.	https://www.topcoder.com/thrive/articles/data-warehousing-and-data-mining#:~:text=Data%20warehousing%20is%20a%20method,compiled%20in%20the%20data%20warehouse.
2.	https://www.javatpoint.com/data-mining-cluster-vs-data-warehousing
3.	https://www.tutorialspoint.com/Data-Warehousing-and-Data-Mining

MappingwithProgrammeOutcomes:

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

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	MOBILEAPPLICATIONDEVELOPMENT		5	-	-	-	4	25	75	100

LearningObjectives	
LO1	Developin-depthKnowledgeaboutthearchitectureandfeaturesofAndroid
LO2	Implementingthevariousoptionsavailableinviews.
LO3	Understandthefilehandlingconceptsandtherebyenablingtomanagedata efficiently.
LO4	AbletodescribeclearlythefeaturesofSMSmessaging.
LO5	IllustratetheconceptsofLocationBasedServices

UNIT	Contents	No. Of.Hours
I	**Android Fundamentals:** Android overview and Versions –Features ofAndroid – Architecture of Android - Setting up Android Environment(Eclipse/AndroidStudio,SDK,AVD)- AnatomyofanAndroidApplication- SimpleAndroidApplicationDevelopment.	**15**
II	**AndroidUserInterface:**Layouts:Linear,Relative,FrameandScrollview-Managing changes to Screen Orientation. Views: TextView,Button, ImageButton, EditText, CheckBox, RadioButton, RadioGroup,ProgressBar,AutoCompleteTextView,ListViewsandWebView	**15**
III	**Data Persistence:** Saving and Loading User Preferences. File Handling:FileSystem-InternalandExternalStorage-Permissions-FileManipulation-ManagingDatausingSqlite:Creationofdatabase-Insertion,RetrievalandUpdationofrecords.	**15**
IV	**SMSMessaging:**SendingandReceivingmessages-SendingE-mail– Networking:DownloadingBinaryData–DownloadingTextFiles.	**15**
V	**Location Based Services:** Displaying maps- Displaying zoom control-Changing view – Adding Markers- Getting the location – Geo-codingPublishingAndroidApplications:Preparingforpublishing-DeployingAPKFiles.	**15**
	TOTALHOURS	**75**

CourseOutcomes		**ProgrammeOutcomes**
CO	Oncompletionofthiscourse, studentswill	
CO1	Appreciatetheimportanceofvisualizationinthedataanalyticssolution	PO1, PO2,PO3, PO4,PO5, PO6

CO2	Applystructuredthinkingtounstructuredproblems	PO1, PO2,PO3, PO4,PO5, PO6

CO3	Understandaverybroadcollectionofmachinelearningalgorithmsandproblems	PO1,PO2, PO3,PO4,PO5 ,PO6
CO4	Learnalgorithmictopicsofmachinelearningandmathematicallydeepenoughtointroducetherequiredtheor	PO1,PO2,PO3 ,PO4, PO5,PO6
CO5	Developanappreciationforwhatisinvolvedinlearningfromdata.	PO1, PO2,PO3, PO4, PO5,PO6
	Textbooks	
1	**WeiMeng Lee (2012),** –*Beginning Android Application Development*‖,WroxPublications(JohnWiley,NewYork)	
	ReferenceBooks	
1.	**EdBurnette**,–*HelloAndroid:IntroducingGoogle'sMobileDevelopmentPlatform*‖, 3rdedition,2010,ThePragmaticPublishers.	
2	**RetoMeier**,–*ProfessionalAndroid4ApplicationDevelopment*‖,2012,WroxPublications(John Wiley,NewYork).	
	WebResources	
1.	https://www.tutorialspoint.com/mobile_development_tutorials.htm	
2	https://www.tutorialspoint.com›Android›Android-Home	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**2**	**-**	**1**	**1**	**1**	**2**
CO2	**2**	**1**	**-**	**1**	**2**	**2**
CO3	**3**	**-**	**1**	**1**	**2**	**3**
CO4	**2**	**2**	**1**	**1**	**1**	**2**
CO5	**2**	**-**	**1**	**1**	**1**	**2**
Weightageof coursecontributedto eachPSO	11	3	4	5	7	11

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	MOBILEAPPLICATIONDEVELOPMENTLAB		4	-	-	-	4	25	75	100

CourseObjectives:

- Toexplainuserdefinedfunctionsandthe conceptsofclass.
- Todemonstratethecreationcookiesandsessions
- TofacilitatethecreationofDatabaseandvalidatetheuserinputs

LabExercises	**RequiredHours**
1. DevelopanapplicationforSimpleCounter. 2. Develop an applicationtodisplayyour personaldetails using GUIComponents. 3. Developa SimpleCalculatorthatusesradiobuttonsandtextview. 4. DevelopanapplicationthatusesIntentandActivity. 5. DevelopanapplicationthatusesDialogBoxes. 6. Developanapplicationtodisplaya SplashScreen. 7. DevelopanapplicationthatusesLayoutManagers. 8. DevelopanapplicationthatusesdifferenttypesofMenus. 9. Developanapplicationthatusestosendmessagesfromonemobiletoanothermobile. 10. Developanapplicationthatusesto sendE-mail.DevelopanapplicationthatplaysAudioand Video. 11. DevelopanapplicationthatusesLocalFileStorage. 12. DevelopanapplicationforSimpleAnimation. 13. DevelopanapplicationforLoginPageusingSqlite. 14. DevelopanapplicationforStudentMarksheetprocessingusingSqlite.	**60**

CourseOutcomes	
CO	Oncompletionofthiscourse, studentswill
CO1	Tounderstandtheconceptsofcounter,dialogs.
CO2	ConceptsofLayoutManagers.PerformsendingemailonaudioandvideoToenabletheapplicationsofaudioandvideo.

CO3	ToapplyLocalFileStorageandDevelopmentoffiles.
CO4	TodeterminetheconceptsofSimple AnimationToapplysearchingpages.
CO5	UsageofStudentmarksheet-preparationinMAD. ConceptsofprocessingSqliteareimplemented.

MappingwithProgrammeOutcomes:

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

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	IntroductiontoData Science		5	-	-	-	4	5	25	75	100

CourseObjective	
LO1	TolearnaboutbasicsofDataScienceandBigdata.
LO2	TolearnaboutoverviewandbuildingprocessofDataScience.
LO3	TolearnaboutvariousAlgorithmsinDataScience.
LO4	TolearnaboutHadoopFramework.
LO5	TolearnaboutcasestudyaboutData Science.

UNIT	Details	No.of Hours
I	**Introduction:**Benefitsanduses–Factsofdata–Datascienceprocess–Bigdataecosystemanddatascience	15
II	**TheDatascienceprocess**:Overview–researchgoals-retrievingdata-transformation–ExploratoryDataAnalysis–Modelbuilding.	15
III	**Algorithms**:Machinelearningalgorithms–Modelingprocess–Types –Supervised– Unsupervised-Semi-supervised	15
IV	**IntroductiontoHadoop**:Hadoopframework–Spark–replacing MapReduce–NoSQL–ACID–CAP–BASE–types	15
V	**CaseStudy**:PredictionofDisease-Settingresearchgoals-Data retrieval–preparation-exploration-Diseaseprofiling-presentationandautomation	15
	Total	**75**

CourseOutcomes		ProgrammeOutcome
CO	Oncompletionofthiscourse, studentswill	
1	UnderstandthebasicsinData ScienceandBigdata.	PO1
2	UnderstandoverviewandbuildingprocessinData Science.	PO1,PO2
3	UnderstandvariousAlgorithmsinDataScience.	PO4,PO6
4	UnderstandHadoopFrameworkinDataScience.	PO4,PO5,PO6

5	CasestudyinDataScience.	PO3,PO8
TextBook		
1	DavyCielen,ArnoD.B.Meysman,MohamedAli,–IntroducingDataScience‖, manningpublications2016	
ReferenceBooks		
1.	RogerPeng,–TheArtofDataScience‖,lulu.com2016.	
2.	MurtazaHaider,–GettingStartedwithDataScience–MakingSenseofDatawith Analytics‖,IBMpress,E-book.	
3.	DavyCielen,ArnoD.B.Meysman,MohamedAli,–IntroducingDataScience:Big Data,MachineLearning,andMore,UsingPythonTools‖,DreamtechPress2016.	
4.	AnnalynNg,KennethSoo,–Numsense!DataScienceforLayman:NoMath Added‖,2017,1stEdition.	
5.	CathyO'Neil,RachelSchutt,–DoingDataScienceStraightTalkfromtheFrontline‖, O'ReillyMedia2013.	
6.	LillianPierson,–DataScienceforDummies‖,2017IIEdition	
WebResources		
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/	

MappingwithProgrammeOutcomes:

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

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

Suggested Topics inElective courses (EC1-EC8)DisciplineSpecificElectives Syllabus

1. SoftwareMetrics
2. NaturalLanguageProcessing
3. AnalyticsforServiceIndustry
4. Cryptography
5. DatabaseManagementSystem
6. BigDataAnalytics
7. IOTanditsApplications
8. SoftwareProjectManagement
9. ImageProcessing
10. InformationSecurity
11. HumanComputerInteraction
12. Fuzzy Logic
13. ArtificialIntelligence
14. MobileAdhocNetwork
15. ComputationalIntelligence
16. GridComputing
17. CloudComputing
18. ArtificialNeuralNetwork
19. AgileProjectManagementandmore..

[Pl.Note:InSemester-VI-ForEC7andEC8subjects Instructionalhoursmaybeusedas:5per cycle]

SOFTWAREMETRICS

SubjectCode	L	T	P	S	Credits	Inst.Hours	Marks		
							CIA	External	Total
	4	-	-	-	3	4	25	75	100

LearningObjectives	
LO1	Gainasolidunderstandingofwhatsoftwaremetricsareandtheirsignificance
LO2	Learnhowtoidentifyandselectappropriatesoftwaremetricsbasedonprojectgoals
LO3	Acquireknowledgeandskillsincollectingandmeasuringsoftwaremetrics
LO4	Learnhowtoanalyzeandinterpretsoftwaremetricsdatatoextractvaluableinsights
LO5	Gaintheabilitytoevaluatesoftwarequalityusingappropriatemetrics

Unit	Contents	No.of Hours
I	**FundamentalsofMeasurement:Needfor**Measurement:Measurement in Software Engineering, Scope of Software Metrics,**TheBasicsofmeasurement**:Therepresentationaltheoryofmeasurement,Measurementandmodels,Measurementscalesand scaletypes,meaningfulnessinmeasurement	**12**
II	**A Goal-Based Framework For Software Measurement:** ClassifyingsoftwaremeasuresDeterminingwhattoMeasure,Applyingtheframework,SoftwaremeasurementvalidationPerformingSoftwareMeasurementValidation **Empirical investigation**:Principles of Empirical Studies,PlanningExperiments,Planningcasestudiesasquasi-experiments,RelevantandMeaningfulStudies	**12**
III	**SoftwareMetricsDataCollection:**Defininggooddata,Datacollection for incident reports, How to collect data, Reliability of datacollection Procedures **Analyzing software measurement data:** Statistical distributions andhypothesis testing,Classicaldata analysis techniques,Examples ofsimpleanalysistechniques	**12**
IV	**Measuring internal product attributes: Size** Properties of SoftwareSize, Code size, Design size, Requirements analysis and Specificationsize, Functionalsize measures and estimators, Applications of sizemeasures **Measuringinternalproductattributes:Structure:**AspectsofStructural Measures, Control flow structure of program units, Design-levelAttributes,Object-orientedStructuralattributesandmeasures	**12**

V	**MeasuringExternalProductAttributes:**Modellingsoftwarequality, Measuringaspectsofquality,UsabilityMeasures,Maintainabilitymeasures,SecurityMeasures **SoftwareReliability:MeasurementandPrediction:**Basicsofreliability theory,Thesoftwarereliabilityproblem,Parametricreliabilitygrowthmodels,Predictiveaccuracy	**12**
TOTAL		**60**

CO	**CourseOutcomes**
CO1	Understandvariousfundamentalsofmeasurementandsoftwaremetrics
CO2	Identifyframeworkandanalysistechniquesforsoftwaremeasurement
CO3	Applyinternalandexternalattributesofsoftwareproductfor effortestimation
CO4	Useappropriateanalyticaltechniquestointerpretsoftwaremetricsdataandderive meaningfulinsights
CO5	Recommendreliabilitymodelsforpredictingsoftwarequality

Textbooks	
➢	SoftwareMetricsARigorousandPracticalApproach,NormanFenton,James Bieman,ThirdEdition,2014
ReferenceBooks	
1	Softwaremetrics,NormanE,FentonandShariLawrencePfleeger,International ThomsonComputerPress,1997
2	Metricandmodelsinsoftwarequalityengineering,StephenH.Kan,Secondedition, 2002,AddisonWesleyProfessional
3	PracticalSoftwareMetricsforProjectManagementandProcessImprovement, RobertB.Grady,1992,PrenticeHall.

NOTE:LatestEditionofTextbooksMaybeUsed

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

MappingwithProgrammeOutcomes:

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

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	NATURALLANGUAGEPROCESSING	**Elect**	4	-	-	-	3	25	75	100
LearningObjectives										
LO1	Tounderstandapproachestosyntaxandsemanticsin NLP.									
LO2	Tolearnnaturallanguageprocessingandtolearnhowtoapplybasicalgorithmsin thisfield.									
LO3	Tounderstand approaches todiscourse,generation,dialogue andsummarizationwithinNLP.									
LO4	Togetacquaintedwiththealgorithmicdescriptionofthemainlanguagelevels:morphology,syntax,semantics,pragmaticsetc.									
LO5	Tounderstandcurrentmethodsforstatisticalapproachestomachinetranslation.									
UNIT	**Contents**									**No. Of.Hours**
I	**Introduction :** Natural Language Processing tasks in syntax, semantics,and pragmatics – Issue- Applications – The role of machine learning –Probability Basics –Information theory – Collocations -N-gram LanguageModels – Estimating parameters and smoothing – Evaluating languagemodels.									**12**
II	**WordlevelandSyntacticAnalysis:**WordLevelAnalysis:RegularExpressions-Finite-State Automata-Morphological Parsing-Spelling ErrorDetectionandcorrection-WordsandWordclasses-Part-ofSpeechTagging.SyntacticAnalysis:Context-freeGrammar-Constituency-Parsing-ProbabilisticParsing.									**12**
III	**SemanticanalysisandDiscourseProcessing:**SemanticAnalysis:Meaning Representation-LexicalSemantics-Ambiguity-WordSenseDisambiguation. Discourse Processing: cohesion-Reference Resolution-DiscourseCoherenceandStructure.									**12**
IV	**NaturalLanguageGeneration:**ArchitectureofNLGSystems-Generation Tasks and Representations- Application of NLG.MachineTranslation: Problems in Machine Translation. Characteristics of IndianLanguages-MachineTranslationApproaches-TranslationinvolvingIndianLanguages.									**12**
V	**Informationretrieval and lexical resources:** Information Retrieval:									

	DesignfeaturesofInformationRetrievalSystems-Classical,Non-classical, Alternative Models of Information Retrieval – valuation LexicalResources:WorldNet-FrameNetStemmers-POSTagger-ResearchCorporaSSAS.	**12**
TOTAL		**60**
CourseOutcomes		**ProgrammeOutcomes**
CO	Oncompletionofthiscourse, studentswill	
CO1	Describethefundamentalconceptsandtechniquesofnaturallanguageprocessing. Explainthe advantages and disadvantages of different NLP technologiesandtheirapplicabilityindifferentbusinesssituations.	PO1, PO2,PO3, PO4,PO5, PO6
CO2	Distinguish among thevarious techniques,takingintoaccounttheassumptions, strengths,andweaknessesofeach UseNLPtechnologiestoexploreandgaina broadunderstandingoftextdata.	PO1, PO2,PO3, PO4,PO5, PO6
CO3	Useappropriatedescriptions,visualizations,andstatisticstocommunicatetheproblemsandtheirsolutions. UseNLPmethodstoanalysesentimentofatextdocument.	PO1, PO2,PO3, PO4,PO5, PO6
CO4	Analyzelargevolumetextdatageneratedfromarangeofreal-worldapplications. UseNLPmethodstoperformtopicmodelling.	PO1, PO2,PO3, PO4,PO5, PO6
CO5	Developroboticprocessautomationtomanagebusinessprocessesandtoincreaseandmonitortheirefficiencyandeffectiveness. Determine the framework in which artificial intelligence and theInternetofthingsmayfunction,includinginteractionswith people,enterprisefunctions,andenvironments.	PO1, PO2,PO3, PO4,PO5, PO6
Textbooks		
1	DanielJurafsky,JamesH.Martin,–Speech&languageprocessing‖,Pearson publications.	
2	Allen,James.Naturallanguageunderstanding.Pearson,1995.	
ReferenceBooks		
1.	PierreM.Nugues,–AnIntroductiontoLanguageProcessingwithPerland Prolog‖,Springer	
WebResources		
1.	https://en.wikipedia.org/wiki/Natural_language_processing	

2.	https://www.techtarget.com/searchenterpriseai/definition/natural-language-processing-NLP

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	1
CO2	2	3	3	3	2	3
CO3	1	3	3	3	1	3
CO4	3	2	1	3	2	3
CO5	3	3	3	3	3	3
Weightageofcoursecontributed to eachPSO	12	14	13	15	11	13

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	ANALYTICS FORSERVICEINDUSTRY	**Elective**	4	-	-	-	3	25	75	100

LearningObjectives

LO1	Recognizechallengesindealing withdatasetsin serviceindustry.
LO2	Identifyand apply appropriate algorithms for analyzing the healthcare, Human resource,hospitalityandtourismdata.
LO3	Makechoicesforamodelfornewmachinelearningtasks.
LO4	Toidentifyemployeeswithhighattritionrisk.
LO5	ToPrioritizingvarioustalentmanagementinitiativesforyourorganization.

UNIT	Contents	No. Of.Hours
I	**Healthcare Analytics :** Introduction to Healthcare Data Analytics- Electronic Health Records– Components of EHR- Coding Systems- Benefits of EHR- Barrier to Adopting HER Challenges- PhenotypingAlgorithms.BiomedicalImage Analysis andSignalAnalysis- GenomicDataAnalysisforPersonalizedMedicine.ReviewofClinicalPrediction Models.	**12**
II	**Healthcare Analytics Applications :** Applications and Practical Systemsfor Healthcare– Data Analytics for Pervasive Health- Fraud Detection inHealthcare-DataAnalyticsforPharmaceuticalDiscoveries- ClinicalDecisionSupportSystems-Computer-AssistedMedicalImageAnalysis Systems-MobileImagingandAnalyticsforBiomedicalData.	**12**
III	**HR Analytics:** Evolution of HR Analytics, HR information systems anddata sources, HR Metric and HR Analytics, Evolution of HR Analytics;HRMetricsandHRAnalytics;Intuitionversusanalyticalthinking; HRMS/HRISanddatasources;AnalyticsframeworkslikeLAMP, HCM:21(r)Model.	**12**
IV	**PerformanceAnalysis:**Predictingemployeeperformance,Trainingrequirements,evaluatingtraininganddevelopment,Optimizingselection andpromotiondecisions.	**12**

V	**Tourism and Hospitality Analytics:** Guest Analytics – LoyaltyAnalytics– CustomerSatisfaction–DynamicPricing–optimized disruptionmanagement–Frauddetectioninpayments.		**12**

	TOTALHOURS	**60**
CourseOutcomes		**ProgrammeOutcomes**
CO	Oncompletionofthiscourse,studentswill	
CO1	Understandandcriticallyapplytheconceptsandmethodsofbusinessanalytics	PO1, PO2,PO3, PO4,PO5, PO6
CO2	Identify,modelandsolvedecisionproblemsindifferentsettings.	PO1,PO2, PO3,PO4,PO5, PO6
CO3	Interpretresults/solutionsandidentifyappropriatecoursesofactionforagivenmanagerialsituationwhetheraproblemoran opportunity.	PO1,PO2,PO3, PO4, PO5,PO6
CO4	Createviablesolutionstodecisionmakingproblems.	PO1,PO2, PO3,PO4,PO5, PO6
CO5	Instill a sense of ethical decision-making and a commitment to thelong-run welfare of both organizations and the communities theyserve.	PO1, PO2,PO3, PO4,PO5, PO6
Textbooks		
1	ChandanK.ReddyandCharuCAggarwal,–Healthcaredataanalytics‖,Taylor&Francis,2015.	
2	EdwardsMartinR,EdwardsKirsten(2016),–PredictiveHRAnalytics:MasteringtheHRMetric‖, KoganPagePublishers, ISBN-0749473924	
3	Fitz-enzJac(2010),–ThenewHRanalytics:predictingtheeconomicvalueofyour company‘shumancapitalinvestments‖,AMACOM,ISBN-13:978-0-8144-1643-3	
4	RajendraSahu,ManojDashandAnilKumar.ApplyingPredictiveAnalyticsWithintheServiceSector.	
ReferenceBooks		
1.	HuiYangandEvaK.Lee,–HealthcareAnalytics:FromDatatoKnowledgetoHealthcareImprovement,Wiley,2016	
2.	Fitz-enzJac,MattoxIIJohn(2014),–PredictiveAnalyticsforHumanResources‖, Wiley,ISBN-1118940709.	
WebResources		
1.	https://www.ukessays.com/essays/marketing/contemporary-issues-in-marketing-marketing-essay.php	
2.	https://yourbusiness.azcentral.com/examples-contemporary-issues-marketing-field-26524.html	

MappingwithProgrammeOutcomes:

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

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	CRYPTOGRAPHY	**Elect**	4	-	-	-	3	25	75	100

LearningObjectives	
LO1	TounderstandthefundamentalsofCryptography
LO2	Toacquireknowledgeonstandardalgorithmsusedtoprovideconfidentiality,integrityand authenticity.
LO3	Tounderstandthevariouskeydistributionandmanagementschemes.
LO4	Tounderstandhowtodeployencryptiontechniquestosecuredataintransitacross datanetworks
LO5	TodesignsecurityapplicationsinthefieldofInformationtechnology

UNIT	Contents	No.Of. Hours
I	**Introduction:**TheOSIsecurityArchitecture–SecurityAttacks–SecurityMechanisms–SecurityServices–AmodelfornetworkSecurity.	**12**
II	**Classical Encryption Techniques:** Symmetric cipher model – **SubstitutionTechniques:**CaesarCipher–Monoalphabeticcipher–Playfaircipher–PolyAlphabeticCipher–Transpositiontechniques–Stenography	**12**
III	**BlockCipherandDES:**BlockCipherPrinciples–DES–TheStrengthofDES–**RSA:**TheRSAalgorithm.	**12**
IV	**NetworkSecurityPractices**:IPSecurityoverview-IPSecurityarchitecture–AuthenticationHeader. **WebSecurity**:SecureSocketLayer andTransportLayerSecurity–SecureElectronicTransaction.	**12**
V	Intruders–Maliciousoftware–Firewalls.	**12**
	TOTALHOURS	**60**

CourseOutcomes		**Programme Outcomes**
CO	Oncompletionofthiscourse, studentswill	
CO1	Analyzethevulnerabilitiesinanycomputingsystemandhencebeabletodesignasecurity solution.	PO1, PO2,PO3, PO4,PO5, PO6
CO2	Apply the different cryptographic operations of symmetriccryptographicalgorithms	PO1, PO2,PO3, PO4,PO5, PO6
CO3	Applythedifferentcryptographicoperationsofpublickeycryptography	PO1,PO2, PO3,PO4,

		PO5,PO6
CO4	ApplythevariousAuthenticationschemestosimulatedifferentapplications.	PO1,PO2,PO3,PO4, PO5,PO6
CO5	Understand various Security practices and System securitystandards	PO1,PO2, PO3,PO4,PO5,PO6
Textbooks		
1	**WilliamStallings,**–CryptographyandNetworkSecurityPrinciplesandPractices‖.	
ReferenceBooks		
1.	**BehrouzA.Foruzan,**–CryptographyandNetworkSecurity‖,TataMcGraw-Hill, 2007.	
2	**AtulKahate**,–*CryptographyandNetworkSecurity*‖,SecondEdition,2003,TMH.	
3	**M.V.ArunKumar**,–*NetworkSecurity*‖,2011,FirstEdition,USP.	
	WebResources	
1	https://www.tutorialspoint.com/cryptography/	
2	https://gpgtools.tenderapp.com/kb/how-to/introduction-to-cryptography	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	1	2	3	2
CO2	3	2	3	2	3	3
CO3	2	3	2	2	2	1
CO4	2	3	3	1	2	3
CO5	3	2	3	3	3	3
Weightageofcoursecontributed to eachPSO	13	13	12	10	13	12

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	Database Managemet System	Core	4	-	-	-	3	4	25	75	100
CourseObjective											
LO1	Toenablethestudentstolearnthedesigningofdatabasesystems,foundationonthe relationalmodelofdataandnormalforms.										
LO2	Tounderstoodtheconceptsofdatabasemanagementsystem,designsimpleDatabase models										
LO3	Tolearnandunderstandto writequeriesusingSQL,PL/SQL.										
LO4	Toenablethestudentstolearnthedesigningofdatabasesystems,foundationonthe relationalmodelofdataandnormalforms.										
LO5	Tounderstoodtheconceptsofdatabasemanagementsystem,designsimpleDatabase models										
UNIT	**Details**								**No.of Hours**		
	DatabaseConcepts: DatabaseSystems-DatavsInformation - Introducing the database -File system -Problems with file system – Database systems. Datamodels-Importance-BasicBuildingBlocks-Business rules - Evolution of Data models - Degrees ofDataAbstraction								12		
II	**Design Concepts:** Relational database model - logicalviewofdata-keys-Integrityrules-relationalsetoperators - datadictionary and thesystem catalog-relationships-dataredundancyrevisited-indexes-codd'srules.Entityrelationshipmodel-ERdiagram								12		
III	**NormalizationofDatabaseTables**:Database tables								12		

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

CourseOutcomes		**ProgrammeOutcomes**
CO	Oncompletionofthiscourse, studentswill	
1	UnderstandthevariousbasicconceptsofDataBase System.DifferencebetweenfilesystemandDBMS	PO1

	andcomparevariousdatamodels.	
2	Definethe integrityconstraints. Understand the basicconceptsofRelationalDataModel,Entity-RelationshipModel.	PO1,PO2
3	Design database schema considering normalizationand relationships within database. Understand andconstructdatabaseusingStructured Query Language.Attain a good practical skill of managing andretrievingofdatausingDataManipulationLanguage (DML)	PO4,PO6
4	Classify the different functions and various joinoperationsandenhancetheknowledgeofhandling multipletables.	PO4,PO5,PO6
5	LearntodesignDatabaseoperationsandimplementusing PL/SQL programs. Learn basics of PL/SQLanddevelopprogramsusingCursors,Exceptions	PO3,PO8
TextBook		
1	Coronel,Morris,Rob,"DatabaseSystems,Design, ImplementationandManagement", NinthEdition	
2	NileshShah,"DatabaseSystemsUsingOracle",2ndedition,PearsonEducationIndia, 2016	
ReferenceBooks		
1.	Abraham Silberschatz, Henry F.Korth and S.Sudarshan,–Database System Concepts‖,McGrawHillInternationalPublication,VIEdition	
2.	ShioKumarSingh,–DatabaseSystems–,Pearsonpublications,IIEdition	
WebResources		
1.	WebresourcesfromNDLLibrary,E-contentfromopen-sourcelibraries	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	3	3	2	3
CO3	3	3	3	3	3	3
CO4	3	3	2	3	3	3
CO5	3	3	3	3	3	2
Weightageofcoursecontributed to eachPSO	15	15	14	15	14	14

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	BigDataAnalytics		4	-	-	-	3	4	25	75	100
CourseObjective											
LO1	UnderstandtheBigDataPlatformanditsUsecases,MapReduceJobs										
LO2	Toidentifyandunderstandthebasicsofclusteranddecisiontree										
LO3	TostudyabouttheAssociationRules,RecommendationSystem										
LO4	Tolearnaboutthe conceptofstream										
LO5	UnderstandtheconceptsofNoSQLDatabases										
UNIT	**Details**							**No. ofHours**			
I	Evolution of Big data — Best Practices for Big dataAnalytics — Big data characteristics — Validating —The Promotion of the Value of Big Data — Big DataUse Cases- Characteristics of Big Data Applications —Perception and Quantification of Value -UnderstandingBig Data Storage —A General Overview of High-PerformanceArchitecture— HDFS—MapReduce andYARN—MapReduceProgrammingModel							12			
II	Advanced Analytical Theory and Methods: Overviewof Clustering — K-means — Use Cases — Overviewof theMethod— DeterminingtheNumberofClusters — Diagnostics — Reasons to Choose and Cautions .- Classification:DecisionTrees—OverviewofaDecision Tree — The General Algorithm — DecisionTreeAlgorithms—EvaluatingaDecisionTree— Decision Trees in R — Naïve Bayes — Bayes Theorem—NaïveBayesClassifier.							12			

III	AdvancedAnalyticalTheoryandMethods:Association	12

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

CourseOutcomes		**ProgrammeOutcomes**
CO	Oncompletionofthiscourse, studentswill	
1	Work withbigdatatoolsanditsanalysistechniques.	PO1

2	Analyzedatabyutilizingclusteringandclassificationalgorithms.	PO1,PO2

3	Learnandapplydifferentminingalgorithmsandrecommendationsystemsforlargevolumesofdata.	PO4,PO6
4	Performanalyticsondatastreams.	PO4,PO5,PO6
5	LearnNoSQLdatabasesandmanagement.	PO3,PO8
TextBook		
1	AnandRajaramanandJeffreyDavidUllman,‐MiningofMassiveDatasets‖, CambridgeUniversityPress,2012.	
ReferenceBooks		
1.	DavidLoshin,‐BigDataAnalytics:FromStrategicPlanningtoEnterprise IntegrationwithTools,Techniques,NoSQL,andGraph‖,MorganKaufmann/ElsevierPublishers,2013	
2.	EMCEducationServices,‐DataScienceandBigDataAnalytics:Discovering, Analyzing,VisualizingandPresentingData‖,Wileypublishers,2015.	
WebResources		
1.	https://www.simplilearn.com	
2.	https://www.sas.com/en_us/insights/analytics/big-data-analytics.html	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	3	2	2	3	1
CO2	3	2	3	2	3	3
CO3	1	3	2	2	2	1
CO4	3	3	3	1	3	3
CO5	3	2	3	3	3	3
Weightageofcoursecontributedtoeach PSO	11	13	13	10	14	11

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	InternetofThingsanditsapplications		4	-	-	-	3	4	25	75	100
CourseObjective											
LO1	UseofDevices,GatewaysandDataManagementinIoT.										
LO2	DesignIoTapplicationsindifferentdomainandbeabletoanalyzetheirperformance										
LO3	ImplementbasicIoTapplicationsonembeddedplatform										
LO4	TogainknowledgeonIndustryInternetofThings										
LO5	ToLearnabouttheprivacyandSecurityissuesinIoT										
UNIT	**Details**							**No. ofHours**			
I	IoT&WebTechnology,TheInternetofThingsToday,TimeforConvergence,TowardstheIoTUniverse,Internet of Things Vision, IoT Strategic Research andInnovationDirections,IoTApplications,FutureInternetTechnologies,Infrastructure,NetworksandCommunication,Processes,DataManagement,Security, Privacy&Trust,DeviceLevelEnergyIssues,IoTRelatedStandardization,Recommendationson ResearchTopics.							12			
II	M2MtoIoT–ABasicPerspective– Introduction,SomeDefinitions,M2MValueChains,IoTValueChains, An emerging industrial structure for IoT, Theinternationaldrivenglobalvaluechainandglobalinformationmonopolies.M2MtoIoT-AnArchitecturalOverview– Buildinganarchitecture,Maindesignprinciplesandneededcapabilities,AnIoTarchitecture outline,standardsconsiderations.							12			

III	IoT Architecture -State of the Art – Introduction, Stateof the art, Architecture. Reference Model-Introduction,Reference Model and architecture, IoTreference Model, IoTReference Architecture- Introduction,	12

	FunctionalView,InformationView,Deploymentand OperationalView,OtherRelevantarchitecturalviews	
IV	IoTApplicationsforValueCreationsIntroduction,IoTapplications for industry: Future Factory Concepts,Brownfield IoT, Smart Objects, Smart Applications,Four Aspects in your Business to Master IoT, ValueCreation from Big Data and Serialization, IoT forRetailing Industry, IoT For Oil and GasIndustry,Opinions on IoT Application and Value for Industry,HomeManagement	12
V	Internet of Things Privacy, Security and GovernanceIntroduction,OverviewofGovernance,PrivacyandSecurityIssues,ContributionfromFP7Projects,Security, Privacy and Trust in IoT-Data-Platforms forSmart Cities, First Steps Towards a Secure Platform,Smartie Approach. DataAggregation for the IoTinSmartCities,Security	12
	Total	**60**

CourseOutcomes		**ProgrammeOutcomes**
CO	Oncompletionofthiscourse, studentswill	
1	Work withbigdatatoolsanditsanalysistechniques.	PO1
2	Analyzedatabyutilizingclusteringandclassificationalgorithms.	PO1,PO2
3	Learnandapplydifferentminingalgorithmsandrecommendationsystemsforlargevolumesofdata.	PO4,PO6
4	Performanalyticsondatastreams.	PO4,PO5,PO6
5	LearnNoSQLdatabasesandmanagement.	PO3,PO8

TextBook	
1	VijayMadisettiandArshdeepBahga,―InternetofThings:(AHands-onApproach)‖, UniversitiesPress(INDIA)PrivateLimited2014,1stEdition.
ReferenceBooks	
1.	MichaelMiller,―TheInternetofThings:HowSmartTVs,SmartCars,SmartHomes, andSmartCitiesAreChangingtheWorld‖,kindleversion.
2.	FrancisdaCosta,―RethinkingtheInternetofThings:AScalableApproachto ConnectingEverything‖,ApressPublications2013,1stEdition,.

3	WaltenegusDargie,ChristianPoellabauer,"FundamentalsofWirelessSensorNetworks: TheoryandPractice‖4..CunoPfister,–GettingStartedwiththeInternetofThings‖, O"ReillyMedia2011
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**
CO2	**2**	**1**	**-**	**1**	**3**	**1**
CO3	**3**	**-**	**1**	**1**	**-**	**1**
CO4	**2**	**-**	**-**	**2**	**1**	**2**
CO5	**2**	**-**	**-**	**2**	**-**	2
Weightageofcourse contributedtoeach PSO	11	1	1	8	4	8

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

SOFTWAREPROJECTMANAGEMENT

SubjectCode	L	T	P	S	Credits	Inst.Hours	Marks		
							CIA	External	Total
	4	-	-	-	3	4	25	75	100

LearningObjectives	
LO1	Todefineandhighlightimportanceofsoftware projectmanagement.
LO2	Toformulateanddefinethesoftwaremanagementmetrics& strategyinmanagingprojects
LO3	
LO4	Understandtoapplysoftwaretestingtechniquesincommercialenvironment

Unit	Contents	No.of Hours
I	Introduction to Competencies - Product Development Techniques - Management Skills - Product Development Life Cycle - SoftwareDevelopmentProcessandmodels-TheSEICMM-International OrganizationforStandardization.	12
II	Managing Domain Processes - Project Selection Models - ProjectPortfolio Management- Financial Processes- Selecting a ProjectTeam - Goal and Scope of the Software Project -Project Planning -Creating the Work Breakdown Structure - Approaches to Building aWBS-ProjectMilestones-WorkPackages-BuildingaWBSfor Software.	12
III	Tasks and Activities - Software Size and Reuse Estimating - TheSEICMM-ProblemsandRisks-CostEstimation- EffortMeasures-COCOMO:ARegressionModel-COCOMOII - SLIM:AMathematicalModel-OrganizationalPlanning-Project RolesandSkillsNeeded.	12
IV	Project Management Resource Activities - Organizational Form andStructure - Software Development Dependencies - Brainstorming -Scheduling Fundamentals - PERTand CPM - Leveling ResourceAssignments-MaptheScheduletoaRealCalendar-CriticalChain Scheduling.	12
V	Quality: Requirements – The SEI CMM - Guidelines - Challenges - QualityFunctionDeployment-BuildingtheSoftwareQualityAssurance - Plan - Software Configuration Management: Principles - Requirements-PlanningandOrganizing-Tools-Benefits-Legal IssuesinSoftware-CaseStudy	12
TOTAL		60

CO	CourseOutcomes
CO1	Understandtheprinciplesandconceptsofprojectmanagement
CO2	Knowledgegainedtotrainsoftwareproject managers
CO3	Applysoftwareprojectmanagementmethodologies.

CO4	Abletocreatecomprehensiveprojectplans
CO5	Evaluateandmitigaterisksassociatedwithsoftwaredevelopmentprocess
Textbooks	
➢	RobertT.Futrell,DonaldF.Shafer,LindaI.Safer,–QualitySoftwareProject Management‖,PearsonEducationAsia2002.
ReferenceBooks	
1.	PankajJalote,–SoftwareProjectManagementinPractice‖,AddisonWesley2002.
2.	Hughes,–SoftwareProjectManagement‖,TataMcGrawHill2004,3rdEdition.
NOTE:LatestEditionofTextbooksMaybeUsed	
WebResources	
1.	NPTEL&MOOCcoursestitledSoftwareProjectManagement
2.	www.smartworld.com/notes/software-project-management

MAPPINGTABLE						
CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	**2**	**2**	**-**	**3**	**3**	**1**
CO2	**2**	**1**	**-**	**3**	**3**	**-**
CO3	**3**	**-**	**1**	**2**	**3**	**3**
CO4	**2**	**3**	**2**	**3**	**2**	**-**
CO5	**2**	**2**	**-**	**3**	**3**	**3**
Weightageofcoursecontributed toeachPSO	**11**	**8**	**3**	**14**	**14**	**7**

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	ImageProcessing	Elective	4	-	-	-	3	4	25	75	100
CourseObjective											
LO1	Tolearnfundamentalsofdigitalimageprocessing.										
LO2	Tolearnabout various2DImagetransformations										
LO3	Tolearnaboutvariousimageenhancementprocessingmethodsandfilters										
LO4	TolearnaboutvariousclassificationofImagesegmentationtechniques										
LO5	Tolearnaboutvariousimagecompressiontechniques										

UNIT	Details	No.of Hours
I	**Digital Image Fundamentals:** Image representation - Basic relationshipbetween pixels, Elements of DIP system -Applications of Digital ImageProcessing - 2D Systems - Classification of 2D Systems - MathematicalMorphology- Structuring Elements- Morphological Image Processing-2DConvolution-2DConvolutionThroughGraphicalMethod-2D ConvolutionThroughMatrixAnalysis	12
II	2DImagetransforms:Propertiesof2D-DFT-Walshtransform-Hadamardtransform-Haartransform-DiscreteCosineTransform-Karhunen-LoeveTransform-SingularValueDecomposition	12
III	ImageEnhancement:Spatialdomainmethods-Pointprocessing-Intensitytransformations-Histogramprocessing-Spatialfiltering-smoothing filter- Sharpening filters - Frequency domain methods: lowpassfiltering, highpassFiltering-Homomorphicfilter.	12
IV	Image segmentation:Classification of Image segmentation techniques - Regionapproach–Clusteringtechniques-Segmentationbasedonthresholding-Edgebasedsegmentation-Classificationofedges-Edge detection-Houghtransform-Activecontour.	12

V	ImageCompression:Needfor compression-Redundancy-Classification ofimage-Compressionschemes-Huffmancoding-Arithmeticcoding-	12

	Dictionarybasedcompression-Transformbasedcompression,	
	Total	**60**

CourseOutcomes		**ProgrammeOutcome**
CO	Oncompletionofthiscourse, studentswill	
1	Understand the fundamental concepts of digitalimageprocessing.	PO1
2	Understandvarious2DImagetransformations	PO1,PO2
3	Understandimageenhancementprocessing techniquesandfilters	PO4,PO6
4	Understandtheclassification of Imagesegmentationtechniques	PO4,PO5,PO6
5	Understandvariousimagecompressiontechniques	PO3,PO8

TextBook	
1	SJayaraman,SEsakkirajan,TVeerakumar,Digitalimageprocessing,TataMcGrawHill,2015
2	GonzalezRafelC,DigitalImageProcessing,PearsonEducation,2009
ReferenceBooks	
1.	1.JainAnilK,Fundamentalsofdigitalimageprocessing:,PHI,1988
2.	KennethRCastleman,Digitalimageprocessing:,PearsonEducation,2/e,2003
3.	PrattWilliamK,DigitalImageProcessing:,JohnWiley,4/e,2007
WebResources	
1.	https://kanchiuniv.ac.in/coursematerials/Digital%20image%20processing%20-Vijaya%20Raghavan.pdf
2.	http://sdeuoc.ac.in/sites/default/files/sde_videos/Digital%20Image%20Processing%203rd%20ed.%20-%20R.%20Gonzalez%2C%20R.%20Woods-ilovepdf-compressed.pdf
3.	https://dl.acm.org/doi/10.5555/559707
4.	https://www.ijert.org/image-processing-using-web-2-0-2

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	3	2	2	3	1
CO2	3	2	3	2	3	3
CO3	3	3	2	2	2	1
CO4	3	3	3	1	3	3
CO5	3	2	3	3	3	3
Weightageofcoursecontributedtoeach PSO	13	13	13	10	14	11

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	InformationSecurity	**Elective**	4	-	-	-	3	4	25	75	100

CourseObjectives	
LO1	Toknowtheobjectivesofinformationsecurity
LO2	Understandthe importance andapplicationofeachofconfidentiality,integrity,authenticationand availability
LO3	Understandvariouscryptographicalgorithms
LO4	Understandthebasiccategoriesofthreatstocomputersandnetworks
LO5	Tostudyabouttheconceptsofsecurityinnetworks,websecurity

UNIT	Details	No.ofHours
I	IntroductiontoInformationSecurity:Securitymindset, ComputerSecurityConcepts(CIA),Attacks,Vulnerabilitiesandprotections,SecurityGoals,SecurityServices, Threats,Attacks,Assets, malware,programanalysisandmechanisms	12
II	TheSecurityProbleminComputing:Themeaningof computerSecurity,ComputerCriminals,Methodsof Defense.Cryptography:ConceptsandTechniques:Introduction,plaintextandciphertext,substitutiontechniques,transpositiontechniques,encryptionanddecryption	12
III	SymmetricandAsymmetricCryptographicTechniques: DES,AES,RSAalgorithms .AuthenticationandDigitalSignatures:UseofCryptographyforauthentication,Secure Hashfunction,Keymanagement–Kerberos	12

IV	Program Security : Non-malicious Program errors – Bufferoverflow,Incompletemediation,Time-of-check to Time-of- use Errors, Viruses, Trapdoors,Salami attack, Man-in-the- middle attacks, Covertchannels.FileprotectionMechanisms,UserAuthenticationDesigningTrustedO.S:Securitypolices,modelsofsecurity,trustedO.Sdesign,Assuranceintrusted O.S.Implementationexamples	12
V	SecurityinNetworks:Threatsinnetworks,Network SecurityControls– Architecture,Encryption,ContentIntegrity,Strong Authentication,AccessControls,WirelessSecurity, Honeypots, Traffic flow security. WebSecurity:Websecurityconsiderations,SecureSocketLayerandTransportLayerSecurity,Secureelectronictransaction	12
	Total	**60**

CourseOutcomes

CourseOutcomes	Oncompletionofthiscourse, studentswill;	**ProgrammeOutcomes**
CO1	Understand network security threats, security services,andcountermeasures	PO1
CO2	Understand vulnerability analysis of network security	PO1,PO2
CO3	Acquirebackgroundonhashfunctions;authentication;firewalls;intrusiondetectiontechniques	PO4,PO6
CO4	Gainhands-onexperiencewithprogrammingandsimulationtechniquesforsecurityprotocols.	PO4,PO5,PO6
CO5	Applymethodsforauthentication,accesscontrol, intrusiondetectionandprevention	PO3,PO8

TextBooks

(LatestEditions)

1.	SecurityinComputing,FourthEdition,byCharlesP.Pfleeger,PearsonEducation
2.	CryptographyAndNetworkSecurityPrinciplesAndPractice,FourthorFifthEdition,WilliamStallings,Pearson
ReferencesBooks **(Latesteditions,andthestyleasgivenbelowmustbestrictlyadheredto)**	
1.	CryptographyandNetworkSecurity:CKShyamala,NHarini,DrTR Padmanabhan,WileyIndia,lstEdition
2.	CryptographyandNetworkSecurity:ForouzanMukhopadhyay,McGraw Hill,2"dEdition
3.	InformationSecurity,PrinciplesandPractice:MarkStamp,WileyIndia
4.	PrinciplesofComputerSceurity:WM.ArthurConklin,GregWhite,TMH
WebResources	
1.	https://www.geeksforgeeks.org/what-is-information-security/
2.	https://www.tutorialspoint.com/what-is-information-security#:~:text=Information%20security%20is%20designed%20and,destruction%2C%20alteration%2C%20and%20disruption.

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**2**	**3**	**1**	**2**	**3**	**2**
CO2	**2**	**-**	**1**	**-**	**3**	**2**
CO3	**-**	**3**	**1**	**3**	**-**	**-**
CO4	**2**	**3**	**1**	**3**	**3**	**-**
CO5	**2**	**3**	**1**	**3**	**3**	**2**
Weightageofcoursecontributed to eachPSO	8	12	5	11	12	6

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	HumanComputerInteraction	Elective	4	-	-	-	3	4	25	75	100
CourseObjective											
LO1	TolearnaboutthefoundationsofHumanComputerInteraction.										
LO2	Tolearnthedesignandsoftwareprocesstechnologies.										
LO3	TolearnHCI modelsandtheories.										
LO4	TolearnMobileEcosystem.										
LO5	TolearnthevarioustypesofWebInterfaceDesign.										

UNIT	Details	No. ofHours
I	**FOUNDATIONSOFHCI:** • TheHuman:I/Ochannels–Memory • Reasoningandproblemsolving;TheComputer:Devices–Memory–processingandnetworks; • Interaction:Models– frameworks–Ergonomics–styles–elements–interactivity-Paradigms.-CaseStudies	12
II	**DESIGN&SOFTWAREPROCESS:** • InteractiveDesign: • Basics– process–scenarios • Navigation:screendesignIterationandprototyping. • HCIinsoftwareprocess: • Software life cycle – usability engineering – Prototyping inpractice–designrationale.Designrules:principles,standards, guidelines,rules.EvaluationTechniques–UniversalDesign	12

III	**MODELSANDTHEORIES:** • HCI Models : Cognitive models:-Socio-Organizational issuesandstakeholderrequirements Communicationandcollaborationmodels-Hypertext, MultimediaandWWW.	12
IV	**MobileHCI:** • MobileEcosystem:Platforms,Applicationframeworks • TypesofMobileApplications:Widgets,Applications,Games • MobileInformationArchitecture,Mobile2.0, • MobileDesign:ElementsofMobileDesign,Tools.-CaseStudies	12
V	**WEB INTERFACE DESIGN:** Designing Web Interfaces – Drag &Drop,DirectSelection,ContextualTools,Overlays,InlaysandVirtualPages,ProcessFlow -CaseStudies	12
	Total	**60**

CourseOutcomes		**ProgrammeOutcome**
CO	Oncompletionofthiscourse, studentswill	
1	UnderstandthefundementalsofHCI.	PO1
2	Understandthedesignandsoftwareprocesstechnologies.	PO1,PO2
3	UnderstandHCImodelsandtheories.	PO4,PO6
4	UnderstandMobile Ecosystem, typesofMobileApplications,mobileArchitectureanddesign.	PO4,PO5,PO6
5	UnderstandthevarioustypesofWebInterface Design.	PO3,PO8
TextBook		
1	AlanDix,JanetFinlay,GregoryAbowd,RussellBeale,‖Human-Computer Interaction‖,III Edition,PearsonEducation,2004(UNITI,II&III)	
2	BrianFling,—‖Mobile Design and Development‖,IEdition,O_ReillyMediaInc.,2009(UNIT–IV)	

3	BillScottandTheresaNeil,―DesigningWebInterfaces‖,FirstEdition,O_Reilly,

	2009.(UNIT-V)
ReferenceBooks	
1.	Shneiderman,−DesigningtheUserInterface:StrategiesforEffectiveHuman-Computer Interaction‖,VEdition,PearsonEducation.
WebResources	
1.	https://www.interaction-design.org/literature/topics/human-computer-interaction
2.	https://link.springer.com/10.1007/978-0-387-39940-9_192
3.	https://en.wikipedia.org/wiki/Human%E2%80%93computer_interaction

MappingwithProgrammeOutcomes:

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

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	FuzzyLogic	Elective	4	-	-	-	3	4	25	75	100
CourseObjective											
LO1	Tounderstandthebasic conceptofFuzzylogic										
LO2	Tolearnthevariousoperationsonrelationproperties										
LO3	Tostudyaboutthemembershipfunctions										
LO4	TolearnabouttheDefuzzificationandFuzzyRule-BasedSystem										
LO5	TolearntheconceptsofApplicationsofFuzzyLogic										
UNIT	**Details**							**No. ofHours**			
I	Introduction toFuzzy Logic- FuzzySets-FuzzySetOperations,PropertiesofFuzzySets,ClassicalandFuzzyRelations:Introduction-CartesianProductofRelation-ClassicalRelations-CardinalityofCrispRelation.							12			
II	OperationsonCrispRelation-PropertiesofCrispRelations-Composition Fuzzy Relations, Cardinality ofFuzzyRelations-OperationsonFuzzyRelations-Properties of Fuzzy Relations-Fuzzy Cartesian ProductandComposition-ToleranceandEquivalenceRelations ,CrispRelation.							12			
III	MembershipFunctions:Introduction,FeaturesofMembershipFunction,ClassificationofFuzzySets,Fuzzification,MembershipValueAssignments,Intuition, Inference,RankOrdering.							12			

IV	Defuzzification: Introduction, Lambda Cuts for FuzzySets, Lambda Cuts for Fuzzy Relations, DefuzzificationMethods,FuzzyRule-BasedSystem:Introduction,FormationofRules,DecompositionofRules,AggregationofFuzzyRules,PropertiesofSetofRules.	12
V	ApplicationsofFuzzyLogic:FuzzyLogicinAutomotiveApplications,FuzzyAntilockBrakeSystem-Antilock-Braking System and Vehicle Speed-EstimationUsing FuzzyLogic.	12
	TOTAL	**60**

CourseOutcomes		**ProgrammeOutcomes**
CO	Oncompletionofthiscourse, studentswill	
1	UnderstandthebasicsofFuzzy sets,operationand properties.	PO1
2	ApplyCartesianproductandcompositiononFuzzyrelations and usethe tolerance and Equivalencerelations.	PO1,PO2
3	Analyzevariousfuzzificationmethodsandfeaturesof membershipFunctions.	PO4,PO6
4	Evaluatedefuzzificationmethodsforrealtimeapplications.	PO4,PO5,PO6
5	DesignanapplicationusingFuzzylogicanditsRelations.	PO3,PO8

TextBook	
1	S.N.Sivanandam,S.SumathiandS.N.Deepa-IntroductiontoFuzzyLogicusingMATLAB,Springer-VerlagBerlinHeidelberg2007.

ReferenceBooks	
1.	GuanrongChenandTrungTatPham-IntroductiontoFuzzySets,FuzzyLogicandFuzzyControlSystems
2.	TimothyJRoss,FuzzyLogicwithEngineeringApplications

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

MappingwithProgrammeOutcomes:

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

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	ArtificialIntelligence	Elective	4	-	-	-	3	4	25	75	100
CourseObjective											
LO1	TolearnvariousconceptsofAITechniques.										
LO2	TolearnvariousSearchAlgorithminAI.										
LO3	Tolearnprobabilisticreasoningandmodelsin AI.										
LO4	TolearnaboutMarkovDecisionProcess.										
LO5	TolearnvarioustypeofReinforcementlearning.										
UNIT	**Details**									**No.of Hours**	
I	Introduction:Concept of AI, history, current status, scope, agents, environments,ProblemFormulations,Reviewoftreeandgraphstructures,Statespacerepresentation,SearchgraphandSearchtree									12	
II	SearchAlgorithms:Randomsearch,Searchwithclosedandopenlist,DepthfirstandBreadthfirstsearch,Heuristicsearch,Bestfirstsearch, A*algorithm,GameSearch									12	
III	ProbabilisticReasoning:Probability,conditionalprobability,BayesRule, Bayesian Networks- representation, construction and inference,temporalmodel,hiddenMarkovmodel.									12	
IV	MarkovDecision process : MDP formulation, utility theory, utility functions,valueiteration,policyiterationandpartiallyobservableMDPs.									12	
V	ReinforcementLearning:Passivereinforcementlearning,directutilityestimation, adaptive dynamic programming, temporal difference learning,activereinforcementlearning-Qlearning									12	
	Total									**60**	
CourseOutcomes								**ProgrammeOutcome**			
CO	Oncompletionofthiscourse, studentswill										

1	UnderstandthevariousconceptsofAITechniques.	PO1
2	UnderstandvariousSearchAlgorithminAI.	PO1,PO2
3	Understandprobabilisticreasoningandmodelsin AI.	PO4,PO6
4	UnderstandMarkovDecisionProcess.	PO4,PO5,PO6
5	UnderstandvarioustypeofReinforcementlearningTechniques.	PO3,PO8
TextBook		
1	StuartRussellandPeterNorvig,−ArtificialIntelligence:AModernApproach‖,3rd Edition,PrenticeHall.	
	ElaineRichandKevinKnight,−ArtificialIntelligence‖,TataMcGrawHill	
ReferenceBooks		
1.	Trivedi,M.C.,−AClassicalApproachtoArtificalIntelligence‖,KhannaPublishing House,Delhi.	
2.	SarojKaushik,−ArtificialIntelligence‖,CengageLearningIndia,2011	
3.	DavidPooleandAlanMackworth,−ArtificialIntelligence:Foundationsfor ComputationalAgents‖,CambridgeUniversityPress2010	
WebResources		
1.	NPTEL&MOOCcoursestitledArtificialIntelligenceandExpertSystems	
2.	https://nptel.ac.in/courses/106106140/	
3.	https://nptel.ac.in/courses/106106126/	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**2**	**3**	**2**	**3**	**2**	**-**
CO2	**2**	**-**	**2**	**3**	**3**	**2**
CO3	**1**	**2**	**-**	**-**	**2**	**3**
CO4	**3**	**1**	**2**	**2**	**2**	**1**
CO5	**2**	**1**	**3**	**1**	**2**	**2**
Weightageofcoursecontributed to eachPSO	10	7	9	9	11	8

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	MobileAd-hocNetwork	Elective	4	-	-	-	3	4	25	75	100
CourseObjective											
LO1	TolearnaboutbasicsconceptsofAd-hocnetwork models.										
LO2	TolearnaboutMediumAccessProtocols(MAC).										
LO3	TolearnaboutNetworkRoutingProtocolsandAlgorithms.										
LO4	TolearnaboutDeliveryandSecurityinTransportLayer.										
LO5	Tolearnaboutcrosslayerdesignandoptimizationtechniques,Integrationofad-hoc withMobileIPnetworks.										

UNIT	Details	No.of Hours
I	**Introduction**:Introductiontoad-hocnetworks– definition,characteristicsfeatures,applications.Characteristicsofwirelesschannel,ad-hocmobilitymodelsindoorandout-doormodels.	12
II	**MediumAccessProtocol:** • MACProtocols:Designissues,goalsandclassification. • Contentionbasedprotocols– withreservation,schedulingalgorithms, protocolsusingdirectionalantennas. • IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.	12
III	**NetworkProtocols:** Routing Protocols: Design issues, goals and classification. Proactive Vsreactiverouting,unicastroutingalgorithms,Multicastroutingalgorithms, hybrid routing algorithm, energy aware routing algorithm,hierarchicalrouting,QoSawarerouting.	12
IV	**End–enddeliveryandsecurity:**TransportLayer:Issuesindesigning –Transportlayerclassification, ad-hoc transportprotocols. Securityissuesinad-hocnetworks:issuesandchallenges,networksecurityattacks,securerouting protocols.	12

V	Needforcrosslayerdesign,crosslayeroptimization,parameteroptimization techniques, cross layer cautionary perspective. Integrationofad-hocwith MobileIP networks.	12
	Total	**60**

CourseOutcomes		**ProgrammeOutcome**
CO	Oncompletionofthiscourse, studentswill	
1	UnderstandthebasicsconceptsofAd-hocnetworkmodels.	PO1
2	UnderstandtheMediumAccessProtocols(MAC).	PO1,PO2
3	UnderstandNetworkRoutingProtocols,designissuesandvarioustypesofRoutingAlgorithms.	PO4,PO6
4	Understandtheconcepts of Delivery andSecurity inTransportLayer.	PO4,PO5,PO6
5	UnderstandcrosslayertechniquesandIntegration ofad-hocwithMobileIPnetworks.	PO3,PO8

TextBook	
1	C.SivaRamMurthyandB.S.Manoj,AdhocWirelessNetworksArchitectureandProtocolsIIedition,PearsonEdition,2007.
	CharlesE.Perkins, Adhoc Networking, Addison –Wesley,2000
ReferenceBooks	
1.	StefanoBasagni,MarcoConti,SilviaGiordanoandIvanstojmenovic,Mobilead-hocnetworking,Wiley-IEEEpress,2004.
2.	MohammadIlyas,Thehandbookofad-hocwirelessnetworks,CRCpress,2002.
3.	T.Camp,J.Boleng,andV.Davies−ASurveyofMobilityModelsforAd-hoc Network‖
4.	Research,−WirelessCommn.andMobileComp-SpecialIssueonMobileAd-hoc networkingResearch,TrendsandApplications‖,Vol.2,no.5,2002,pp.483–502.
5.	A survey of integrating IP mobility protocols and Mobile Ad-hoc networks,FekriM.bduljalilandShrikant K.Bodhe,IEEEcommunicationSurveyandtutorials,no:12007.
WebResources	
1.	https://en.wikipedia.org/wiki/Wireless_ad_hoc_network
2.	https://www.ijert.org/mobile-ad-hoc-network

3.	https://books.google.com/books/about/Mobile_Ad_Hoc_Networking.html id=GnkcHEsxAigC

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**2**	**2**	**-**	**3**	**3**	**1**
CO2	**2**	**1**	**2**	**3**	**3**	**-**
CO3	**3**	**2**	**1**	**2**	**3**	**3**
CO4	**3**	**3**	**2**	**3**	**2**	**-**
CO5	**2**	**2**	**-**	**3**	**3**	**3**
Weightageofcoursecontributed to eachPSO	12	10	5	14	14	7

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	ComputatiionalIntelligence	Elective	4	-	-	-	3	4	25	75	100

CourseObjective	
LO1	ToidentifyandunderstandthebasicsofAIanditssearch.
LO2	TostudyabouttheFuzzylogicsystems.
LO3	UnderstandandapplytheconceptsofNeuralNetworkanditsfunctions.
LO4	UnderstandtheconceptsofArtificalNeuralNetwork
LO5	TostudyabouttheGeneticAlgorithm.

UNIT	Details	No. ofHours
I	**Introduction to AI**: Problem formulation – AIApplications – Problems – State Space and Search – ProductionSystems–BreadthFirstandDepthFirst– Travelling Salesman Problem – Heuristic searchtechniques: Generate and Test – Types of HillClimbing.	12
II	**FuzzyLogicSystems:** Notion of fuzziness – Operations on fuzzy sets – T-norms and other aggregation operators – Basics ofApproximate Reasoning – Compositional Rule ofInference – Fuzzy Rule Based Systems – Schemesof Fuzzification – Inferencing – Defuzzification –FuzzyClustering–fuzzyrule-basedclassifier.	12
III	**NeuralNetworks:**WhatisNeuralNetwork,Learningrules andvarious activation functions,Single layerPerceptions, Back Propagation networks, Architectureof Backpropagation (BP) Networks, Back propagationLearning, Variation of Standard Back propagation	12

	NeuralNetwork,IntroductiontoAssociativeMemory,	

	Adaptive Resonance theory and Self Organizing Map,RecentApplications	
IV	**ArtificialNeuralNetworks:**FundamentalConcepts – Basic Models of Artificial Neural Networks – ImportantTerminologiesofANNs–McCulloch-PittsNeuron–LinearSeparability–HebbNetwork.	12
V	**Genetic Algorithm:** Introduction– BiologicalBackground – Genetic Algorithm Vs TraditionalAlgorithm– BasicTerminologiesinGeneticAlgorithm– SimpleGA–GeneralGeneticAlgorithm– OperatorsinGeneticAlgorithm	12
	Total	**60**

CourseOutcomes		**ProgrammeOutcomes**
CO	Oncompletionofthiscourse, studentswill	
1	Describethefundamentalsofartificialintelligenceconceptsandsearchingtechniques.	PO1
2	Developthefuzzylogicsetsandmembershipfunctionand defuzzificationtechniques.	PO1,PO2
3	Understand theconceptsof Neural Networkandanalyzeandapplythelearningtechniques	PO4,PO6
4	Understandtheartificialneuralnetworksanditsapplications.	PO4,PO5,PO6
5	Understand theconceptof GeneticAlgorithm andAnalyzetheoptimizationproblemsusingGAs.	PO3,PO8

TextBook	
1	S.N.SivanandamandS.N.Deepa,–PrinciplesofSoftComputing‖,2ndEdition,Wiley IndiaPvt.Ltd.
2	StuartRussellandPeterNorvig,–ArtificialIntelligence-AModernApproach‖,2nd Edition,Pearson Educationin Asia.
3	S.Rajasekaran,G.A.Vijayalakshmi,–NeuralNetworks,FuzzyLogicandGenetic Algorithms:Synthesis&Applications‖,PHI.
ReferenceBooks	
1.	F.Martin,Mcneill,andEllenThro,–FuzzyLogic:APracticalapproach‖,AP Professional,2000.ChinTeng Lin,C.S.GeorgeLee,‖Neuro-Fuzzy Systems‖,PHI

2.	ChinTengLin,C.S.GeorgeLee,‖Neuro-FuzzySystems‖,PHI.
WebResources	
1.	https://www.javatpoint.com/artificial-intelligence-tutorial
2.	https://www.w3schools.com/ai/

MappingwithProgrammeOutcomes:

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

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	GridComputing	Elective	4	-	-	-	3	4	25	75	100
CourseObjective											
LO1	TolearnthebasicconstructionandapplicationofGridcomputing.										
LO2	TolearngridcomputingorganizationandtheirRole.										
LO3	TolearnGridComputingAnotomy.										
LO4	TolearnGridComputingroadmap.										
LO5	TolearnvarioustypeofGridArchitecture.										
UNIT	**Details**									**No. ofHours**	
I	Introduction:EarlyGridActivity,CurrentGridActivity,OverviewofGridBusinessareas,GridApplications, GridInfrastructures.									12	
II	Grid Computing organization and their Roles: Organizations DevelopingGridStandards,andBestPracticeGuidelines,GlobalGridForum (GCF),#OrganizationDevelopingGridComputingToolkitsandFramework #, Organization and building and using grid based solutionstosolvecomputing,commercialorganizationbuildingandGridBased solutions.									12	
III	Grid Computing Anatomy: The Grid Problem, The conceptual of virtualorganizations, # Grid Architecture # and relationship to other distributedtechnology.									12	
IV	The Grid Computing Road Map: Autonomic computing, Business ondemand and infrastructure virtualization, Service-Oriented ArchitectureandGrid,#SemanticGrids#.									12	
V	MergingtheGridservicesArchitecturewiththeWebServicesArchitecture: Service-Oriented Architecture, Web Service Architecture,#XMLmessagesandEnveloping#,ServicemessagedescriptionMechanisms,RelationshipbetweenWebServicesandGridServices, WebservicesInteroperabilityandtheroleoftheWS-IOrganization.									12	
	Total									**60**	
CourseOutcomes									**ProgrammeOutcome**		
CO	Oncompletionofthiscourse, studentswill										

1	Tounderstandthebasicelementsandconceptsof	PO1

	Gridcomputing.	
2	TounderstandtheGridcomputingtoolkitsand Framework.	PO1,PO2
3	TounderstandtheconceptsofAnotomyofGrid Computing.	PO4,PO6
4	Tounderstandtheconceptofserviceoriented architecture.	PO4,PO5,PO6
5	ToGainknowledgeongridandwebservice architecture.	PO3,PO8
TextBook		
1	JoshyJosephandCraigFellenstein,Gridcomputing,Pearson/IBMPress,PTR,2004.	
ReferenceBooks		
1.	1.AhmerAbbasandGraigcomputing,APracticalGuidetotechnologyandapplications,CharlesRiverMedia,2003.	
WebResources		
1.	https://en.wikipedia.org/wiki/Grid_computing	
2.	https://link.springer.com/chapter/10.1007/978-1-84882-409-6_4	
3.	https://www.redbooks.ibm.com/redbooks/pdfs/sg246778.pdf	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**2**	**3**	**1**	**2**	**1**	**2**
CO2	**2**	**1**	**2**	**1**	**3**	**1**
CO3	**3**	**2**	**1**	**1**	**-**	**1**
CO4	**3**	**-**	**3**	**2**	**1**	**3**
CO5	**2**	**3**	**1**	**2**	**3**	2
Weightageofcourse contributedtoeach PSO	12	9	8	8	8	9

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	CloudComputing	Elective	4	-	-	-	3	4	25	75	100
CourseObjective											
LO1	LearningfundamentalconceptsandTechnologiesofCloudComputing.										
LO2	Learningvariouscloudservicetypesandtheirusesandpitfalls.										
LO3	TolearnaboutCloudArchitectureand Applicationdesign.										
LO4	To know thevarious aspects of applicationdesign,benchmarking andsecurityon theCloud.										
LO5	TolearnthevariousCaseStudiesinCloudComputing.										
UNIT	**Details**										**No. ofHours**
I	Introduction to Cloud Computing: Definition of Cloud Computing – Characteristics of Cloud Computing – Cloud Models – Cloud ServiceExamples–Cloud-basedServicesandApplications. Cloud Concepts and Technologies: Virtualization – Load balancing – Scalability and Elasticity – Deployment – Replication – Monitoring – SoftwareDefinedNetworking–NetworkFunctionVirtualization– MapReduce–IdentityandAccessManagement– ServiceLevelAgreements–Billing.										12
II	CloudServices Compute Services: Amazon Elastic Computer Cloud - Google ComputeEngine-WindowsAzureVirtualMachines StorageServices:AmazonSimpleStorageService-GoogleCloudStorage-WindowsAzureStorage Database Services: Amazon Relational Data Store - Amazon DynamoDB - Google Cloud SQL - Google Cloud Data Store - Windows AzureSQLDatabase-WindowsAzureTableService Application Services: Application Runtimes and Frameworks - QueuingServices-EmailServices-NotifictionServices-MediaServices ContentDeliveryServices:AmazonCloudFront-WindowsAzureContentDelivery Network Analytics Services: Amazon Elastic MapReduce - Google MapReduceService-GoogleBigQuery-WindowsAzureHDInsight										12

	DeploymentandManagementServices:AmazonElasticBeanstack-AmazonCloudFormation IdentityandAccessManagementServices:AmazonIdentiy andAccessManagement-WindowsAzureActiveDirectory OpenSource Private Cloud Software: CloudStack– Eucalyptus - OpenStack	
III	**Cloud Application Design:** Introduction – Design Consideration forCloudApplications–Scalability–ReliabilityandAvailability–Security – Maintenance and Upgradation – Performance – ReferenceArchitecturesforCloudApplications– CloudApplicationDesignMethodologies:ServiceOrientedArchitecture(SOA),CloudComponentModel,IaaS,PaaSandSaaSServicesforCloudApplications, Model View Controller (MVC), RESTful Web Services –Data Storage Approaches: Relational Approach (SQL), Non-RelationalApproach(NoSQL).	12
IV	**CloudApplicationBenchmarkingandTuning:**IntroductiontoBenchmarking – Steps in Benchmarking – Workload Characteristics – ApplicationPerformanceMetrics– DesignConsiderationforBenchmarkingMethodology– BenchmarkingToolsandTypesofTests –DeploymentPrototyping. **Cloud Security:** Introduction – CSA Cloud Security Architecture – Authentication(SSO)–Authorization–IdentityandAccessManagement – Data Security : Securing data at rest, securing data inmotion – KeyManagement–Auditing.	12
V	**Case Studies:** Cloud Computing for Healthcare – Cloud Computing forEnergy Systems - Cloud Computing for Transportation Systems - CloudComputingforManufacturingIndustry- CloudComputingforEducation.	12
	Total	**60**

CourseOutcomes		**ProgrammeOutcome**
CO	Oncompletionofthiscourse, studentswill	
1	UnderstandthefundamentalconceptsandTechnologiesinCloudComputing.	PO1
2	Able to understandvarious cloudservicetypes andtheirusesand pitfalls.	PO1,PO2
3	AbletounderstandCloudArchitectureand	PO4,PO6

	Applicationdesign.	
4	Understand thevarious aspectsof applicationdesign,benchmarkingandsecurityintheCloud.	PO4,PO5,PO6
5	UnderstandvariousCaseStudiesinCloudComputing.	PO3,PO8
TextBook		
1	ArshdeepBahga, VijayMadisetti,*CloudComputing–AHandsOnApproach*, UniversitiesPress(India)Pvt.Ltd.,2018	
ReferenceBooks		
1.	AnthonyT Velte,TobyJVelte,RobertElsenpeter,*CloudComputing:APractical Approach*,TataMcGraw-Hill,2013.	
2.	BarrieSosinsky,*CloudComputingBible*,WileyIndiaPvt.Ltd.,2013.	
3.	DavidCrookes,*CloudComputinginEasySteps*,TataMcGrawHill,2015.	
4.	Dr.KumarSaurabh,*CloudComputing*,WileyIndia,SecondEdition2012.	
WebResources		
1.	https://en.wikipedia.org/wiki/Cloud_computing	
2.	https://link.springer.com/chapter/10.1007/978-3-030-34957-8_7	
3.	https://webobjects.cdw.com/webobjects/media/pdf/solutions/cloud-computing/121838-CDW-Cloud-Computing-Reference-Guide.pdf	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**2**	**2**	**2**	**3**	**3**	**1**
CO2	**3**	**1**	**2**	**3**	**3**	**-**
CO3	**3**	**2**	**1**	**2**	**1**	**3**
CO4	**3**	**3**	**2**	**3**	**2**	**-**
CO5	**2**	**2**	**1**	**3**	**3**	**3**
Weightageofcoursecontributed to eachPSO	13	10	8	14	12	7

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	ArtificialNeural Networks		4	-	-	-	3	4	25	75	100
CourseObjective											
LO1	**Understand thebasicsofartificialneuralnetworks,learningprocess,singlelayer andmulti-layerperceptronnetworks.**										
LO2	UnderstandtheErrorCorrectionandvariouslearningalgorithmsandtasks.										
LO3	IdentifythevariousSingleLayerPerceptionLearningAlgorithm.										
LO4	IdentifythevariousMulti-LayerPerceptionNetwork.										
LO5	AnalyzetheDeepLearningofvariousNeuralnetworkanditsApplications.										
UNIT	**Details**										**No. ofHours**
I	ArtificialNeuralModel-Activationfunctions-FeedforwardandFeedback, Convex Sets, Convex Hull and Linear Separability, Non-Linear Separable Problem - Multilayer Networks. Learning Algorithms-Errorcorrection-GradientDescentRules,PerceptionLearning Algorithm,PerceptionConvergenceTheorem.										12
II	Introduction,Errorcorrectionlearning,Memory-basedlearning,Hebbianlearning,Competitivelearning,Boltzmannlearning,creditassignmentproblem,Learningwithandwithoutteacher,learningtasks, MemoryandAdaptation.										12
III	.SinglelayerPerception:Introduction,PatternRecognition,Linearclassifier, Simple perception, Perception learning algorithm, ModifiedPerception learning algorithm, Adaptive linear combiner, Continuousperception,Learningincontinuousperception.LimitationofPerception.										12

IV	Multi-LayerPerceptionNetworks:Introduction,MLP with2hidden layers,SimplelayerofaMLP,Deltalearningruleoftheoutputlayer,	12

	Multilayerfeedforwardneuralnetworkwithcontinuousperceptions, Generalizeddeltalearningrule,Backpropagationalgorithm	
V	Deep learning- Introduction- Neuro architectures building blocks for theDL techniques, Deep Learning and Neocognitron, Deep ConvolutionalNeural Networks, Recurrent Neural Networks (RNN), feature extraction,DeepBeliefNetworks,RestrictedBoltzmanMachines,TrainingofDNN andApplications	12
	Total	**60**

CourseOutcomes		**ProgrammeOutcome**
CO	Oncompletionofthiscourse, studentswill	
1	**Studentswilllearnthebasicsofartificialneuralnetworks with single layer and multi-layer perceptionnetworks.**	PO1
2	Learn about the Error Correction and various learningalgorithmsandtasks.	PO1,PO2
3	LearnthevariousPerceptionLearningAlgorithm.	PO4,PO6
4	Learnabout the various Multi-Layer Perception Network.	PO4,PO5,PO6
5	Understandthe Deep Learning of various Neural networkanditsApplications.	PO3,PO8

TextBook	
1	NeuralNetworksAClassroomApproach-SatishKumar,McGrawHill-SecondEdition.
2.	–NeuralNetwork-AComprehensiveFoundation‖-SimonHaykins,PearsonPrentice Hall,2nd Edition,1999.
ReferenceBooks	
1.	ArtificialNeuralNetworks-B.Yegnanarayana,PHI,NewDelhi1998.
WebResources	
1.	https://www.w3schools.com/ai/ai_neural_networks.asp
2.	https://en.wikipedia.org/wiki/Artificial_neural_network
3.	https://link.springer.com/chapter/10.1007/978-3-642-21004-4_12

MappingwithProgrammeOutcomes:

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

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	AgileProject Management	Elective	4	-	-	-	3	4	25	75	100
CourseObjective											
LO1	Learningofsoftwaredesign,softwaretechnologiesand APIs.										
LO2	DetaileddemonstrationaboutAgiledevelopmentandtestingtechniques.										
LO3	LearningaboutAgilePlanningandExecution.										
LO4	ingofAgileManagementDesignandQualityCheck.										
LO5	DetailedexaminationofAgiledevelopmentandtestingtechniques.										

UNIT	Details	No.of Hours
I	**Introduction:ModernizingProjectManagement:**ProjectManagement NeededaMakeover–IntroducingAgileProjectManagement. **ApplyingtheAgileManifestoandPrinciples:**UnderstandingtheAgile manifesto – Outlining the four values of the Agile manifesto –Defining the 15 Agile Principles – Adding the Platinum Principles – ChangesasaresultofAgileValues–TheAgilelitmustest. **Why BeingAgile Works Better:**Evaluating Agile benefits – HowAgile approaches beat historical approaches – Why people like beingAgile.	12
II	**BeingAgile** **Agile Approaches:** Diving under the umbrella of Agile approaches – ReviewingtheBigThree:Lean,Scrum,ExtremeProgramming-Summary	12

	AgileEnvironmentsinAction: Creatingthephysicalenvironment–Low-techcommunicating–High-techcommunicating–Choosingtools. **AgileBehaviorsinAction:**EstablishingAgileroles–Establishingnewvalues–Changingteamphilosophy.	
III	**AgilePlanningandExecution** **DefiningtheProductVisionandRoadmap:**Agileplanning–Defining the product vision – Creating a product roadmap – Completingtheproductbacklog. **Planning Releases and Sprints:** Refining requirements and estimates – Releaseplanning–Sprintplanning. **WorkingThroughouttheDay:**Planningyourday–Trackingprogress – Agile roles in the sprint – Creating shippable functionality – The endoftheday. **Showcasing Work, Inspecting and Adapting:** The sprint review – Thesprintretrospective. **PreparingforRelease:**Preparingtheproductfordeployment(thereleasesprint)–Preparingtheoperationalsupport–Preparingtheorganization for product deployment - Preparing the marketplace forproductdeployment	12
IV	**AgileManagement** **Managing Scope and Procurement:** What‘s different about Agilescopemanagement–ManagingAgilescope–What‘sdifferentaboutAgileprocurement–ManagingAgileprocurement. **Managing Time and Cost:** What‘s different about Agile timemanagement–ManagingAgileschedules–What‘sdifferentaboutAgilecost management–ManagingAgilebudgets. **Managing Team Dynamics and Communication:** What‘s differentaboutAgileteamdynamics– ManagingAgileteamdynamics–What‘s	12

	differentaboutAgilecommunication–ManagingAgilecommunication. **ManagingQualityandRisk:**What'sdifferentaboutAgilequality–ManagingAgilequality–What'sdifferentaboutAgileriskmanagement –ManagingAgilerisk.	
V	**ImplementingAgile** **Building a Foundation:** Organizational and individual commitment – Choosingtherightpilotteammembers– CreatingandenvironmentthatenablesAgility– SupportAgilityinitiallyandovertime. **BeingaChangeAgent:**BecomingAgilerequireschange– whychangedoesn't happen on its own – Platinum Edge's Change Roadmap –Avoidingpitfalls–Signsyourchangesareslipping. **Benefits, Factors for Success and Metrics:** Ten key benefits of Agileproject management – Ten key factors for project success – Ten metricsforAgileOrganizations.	12
	Total	**60**

CourseOutcomes		**ProgrammeOutcome**
CO	Oncompletionofthiscourse, studentswill	
1	Understanding of software design, softwaretechnologiesandAPIsusing AgileManagement.	PO1
2	Understanding of Agiledevelopmentandtestingtechniques.	PO1,PO2
3	UnderstandingaboutAgilePlanningandExecutionusing Sprint.	PO4,PO6
4	Understanding of Agile Management Design, scope ,Procurement, managing Time and Cost and QualityCheck.	PO4,PO5,PO6

5	Analysing of Agile development and testingtechniques.	PO3,PO8
TextBook		
1	MarkC.Layton,StevenJ.Ostermiller,AgileProjectManagementforDummies,2ndEdition, Wiley IndiaPvt.Ltd.,2018.	
	Jeff Sutherland, Scrum – The Art of Doing Twice the Work in Half the Time, Penguin,2014.	
ReferenceBooks		
1.	MarkC.Layton,DavidMorrow,*ScrumforDummies*,2nd Edition,WileyIndiaPvt.Ltd.,2018.	
2.	MikeCohn,SucceedingwithAgile– SoftwareDevelopmentusingScrum,Addison-WesleySignatureSeries,2010.	
3.	AlexMoore,AgileProjectManagement,2020.	
4.	AlexMoore,*Scrum*,2020.	
5.	Andrew Stellmanand JenniferGreene,*LearningAgile: UnderstandingScrum, XP,Lean,andKanban*,Shroff/O'Reilly,FirstEdition,2014.	
WebResources		
1.	www.agilealliance.org/resources	

MappingwithProgrammeOutcomes:

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

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

AnnexureII

SkillEnhancementCourse(SEC1–SEC8)

1. FundamentalsofInformationTechnology
2. IntroductiontoHTML
3. WebDesigning
4. PHPProgramming
5. Software Testing
6. ProblemSolvingTechniques
7. UnderstandingInternet
8. Office Automation
9. Quantitative Aptitude
10. OpenSourceTechnologies
11. MultimediaSystems
12. AdvancedExcel
13. Biometrics
14. CyberForensics
15. PatternRecognition
16. EnterpriseResourcePlanning
17. RoboticsandApplications
18. SimulationandModelling
19. OrganizationBehaviorandmore..

Subject Code	SubjectName	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	FUNDAMENTALSOFINFORMATIONTECHNOLOGY	SpecificElective	2	-	-	-	2	25	75	100

Learning Objectives	
LO1	Understandbasicconceptsandterminologyofinformationtechnology.
LO2	Have abasicunderstandingofpersonalcomputersandtheiroperation
LO3	Beabletoidentifydatastorageanditsusage
LO4	Get greatknowledgeofsoftware anditsfunctionalities
LO5	Understandaboutoperatingsystemandtheiruses

UNIT	Contents	No.Of. Hours
I	**IntroductiontoComputers**-GenerationsofComputer–DataandInformation – Components of Computer – Software – Hardware – InputDevices-OutputDevices—TypesofOperatingSystem.	**6**

II	**MSWord**:Introduction–ElementsofWindow–Files,FoldersandDirectories – Text Manipulating: Cut, Copy, Paste, Drag and Drop – TextFormatting: Font – Style, Size, Face and Colors (Both foreground andbackground)– Alignment-BulletsandNumbering-Headerandfooter-watermark–insertingobjects(images,otherapplicationdocument)– Tablecreation – Mailmerge.	**6**
III	**MsExcel**:Introduction–Insertingrowsandcolumns–Sizingrowsandcolumns– Implementingformulas–Generating series-Functionsinexcel –CreationofChart–Insertingobjects–Filter–Sorting–Insertingworksheet.	**6**
IV	**MSPowerPoint**:Introduction– SlidesManipulation(Insertingnew,Copy,paste, delete and duplicate slides) –Slide show– Types of Views – TypesofAnimations–InsertingObjects– Implementingmultimedia(Videoand Audio)–Templates(Built-inandUser-Defined).	**6**
V	**Internet**: Introductionto Internet and Intranet–Services of Internet-Domain Name – URL – Browser – Types of Browsers – Search Engine -E-Mail – Basic Components of E-Mail –.How to send groupmail.**E-Commerce**:DigitalSignature–DigitalCurrency–Onlineshoppingand transaction.	**6**
	TOTALHOURS	**30**

CourseOutcomes		**Programme Outcomes**
CO	Oncompletionofthiscourse,studentswill	
CO1	Learnthebasicsofcomputer,Construct thestructureoftherequiredthingsincomputer,learnhowtouseit.	PO1, PO2, PO3,PO4,PO5, PO6
CO2	Developorganizationalstructureusingforthedevicespresentcurrentlyunderinput outputunit.	PO1, PO2, PO3,PO4,PO5, PO6
CO3	ConceptofstoringdataincomputerusingtwoheadernamelyRAMandROMwithdifferenttypesofROMwithadvancementinstoragebasis.	PO1, PO2, PO3,PO4,PO5, PO6
CO4	Work withdifferent software,Writeprograminthesoftwareand applicationsofsoftware.	PO1, PO2, PO3,PO4,PO5, PO6
CO5	UsageofOperatingsystemininformationtechnologywhichreallyacts asainterpreterbetweensoftwareand hardware.	PO1,PO2,PO3, PO4,PO5,PO6

Textbooks

1	AnoopMathew,S.KavithaMurugeshan(2009),―FundamentalofInformationTechnology‖,MajesticBooks.
2	AlexisLeon,MathewsLeon,‖FundamentalofInformationTechnology‖,2nd Edition.
3	S.KBansal,–FundamentalofInformationTechnology‖.

ReferenceBooks

1.	BhardwajSushilPuneetKumar,–FundamentalofInformationTechnology‖
2.	GGWILKINSON,–FundamentalsofInformationTechnology‖,Wiley-Blackwell
3.	ARavichandran,–FundamentalsofInformationTechnology‖,KhannaBookPublishing
WebResources	
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

MappingwithProgrammeOutcomes:

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

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

Subject Code	SubjectName	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	INTRODUCTIONTOHTML	Specific Elective	2	-	-		2	25	75	100

Learning Objectives	
LO1	Inserta graphicwithinawebpage.
LO2	Createalinkwithinawebpage.
LO3	Createatablewithinawebpage.
LO4	Insertheadinglevelswithinawebpage.
LO5	Insertorderedandunorderedlistswithina webpage.Createawebpage.

UNIT	Contents	No.Of. Hours
I	Introduction:WebBasics:What isInternet–Webbrowsers–WhatisWebpage –HTMLBasics:Understandingtags.	**6**
II	Tags forDocumentstructure(HTML,Head,Body Tag).Blockleveltextelements:Headingsparagraph(<p>tag)–Font styleelements:(bold,italic, font,small,strong,strike,bigtags)	**6**
III	Lists:Types oflists:Ordered,Unordered–NestingLists –Othertags:Marquee, HR,BR-UsingImages–CreatingHyperlinks.	**6**
IV	Tables:CreatingbasicTable,Tableelements,Caption–Tableandcellalignment– Rowspan,Colspan –Cellpadding.	**6**
V	Frames:Frameset–TargetedLinks–Noframe–Forms :Input,Textarea,Select,Option.	**6**
	TOTALHOURS	**30**

CourseOutcomes		**Programme Outcomes**
CO	Oncompletionofthiscourse,studentswill	
CO1	Knows the basic concept in HTMLConceptof resourcesinHTML	PO1, PO2, PO3,PO4,PO5,PO6
CO2	Knows Design concept.Conceptof MetaData Understandtheconcept ofsave the files.	PO1, PO2, PO3,PO4,PO5,PO6
CO3	Understand the page formatting.Conceptoflist	PO1, PO2, PO3,PO4,PO5,PO6
CO4	CreatingLinks. Knowtheconceptofcreatinglinktoemailaddress	PO1, PO2,PO3, PO4,PO5,PO6
CO5	Conceptof addingimages Understandthetablecreation.	PO1, PO2,PO3, PO4,PO5,PO6

Textbooks

1 –MasteringHTML5andCSS3MadeEasy‖,TeachUCompInc.,2014.

2	**ThomasMichaud, “FoundationsofWebDesign:IntroductiontoHTML&CSS”**

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

MappingwithProgrammeOutcomes:

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

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.	Marks		
									CIA	External	Total
	WEBDESIGNING	Specific Elective	2	-	-	-	2	2	25	75	100
CourseObjective											
LO1	Understandthebasicsof HTMLanditscomponents										
LO2	TostudyabouttheGraphicsinHTML										
LO3	Understandandapplytheconceptsof XMLandDHTML										
LO4	UnderstandtheconceptofJavaScript										
LO5	Toidentifyandunderstandthe goalsandobjectivesoftheAjax										

UNIT	Details	No.ofHours
I	HTML:HTML-Introduction-tagbasics-pagestructure-addingcommentsworkingwithtexts,paragraphs and line break. Emphasizing test-headingandhorizontalrules-list-fontsize,faceandcolor-alignmentlinks-tables-frames.	6
II	Forms&ImagesUsingHtml:Graphics:Introduction-How to work efficiently with images inwebpages,imagemaps,GIFanimation,addingmultimedia, data collection with html forms textbox,password,listbox,combobox,textarea,toolsfor buildingwebpagefrontpage.	6
III	XML & DHTML: Cascading style sheet (CSS)-whatis CSS-Why we use CSS-adding CSS to your webpages-Groupingstyles-extensiblemarkuplanguage(XML).	6
IV	Dynamic HTML: Document object model (DCOM)-Accessing HTML & CSS through DCOM Dynamiccontentstyles&positioning-Eventbubbling-databinding. JavaScript: Client-side scripting, What is JavaScript,HowtodevelopJavaScript,simpleJavaScript,variables,functions,conditions,loopsandrepetition,	6

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

CourseOutcomes		**ProgrammeOutcome**
CO	Oncompletionofthiscourse,studentswill	
1	DevelopworkingknowledgeofHTML	PO1, PO3,PO6, PO8
2	AbilitytoDevelopandpublishWebpagesusingHypertextMarkupLanguage(HTML).	PO1,PO2,PO3,PO6
3	Abilitytooptimizepagestylesandlayoutwith CascadingStyleSheets(CSS).	PO3,PO5
4	Abilitytodevelopajavascript	PO1,PO2,PO3, PO7
5	AnabilitytodevelopwebapplicationusingAjax.	P02,PO6,PO7

TextBook	
1	PankajSharma,–WebTechnology‖,SkKataria&SonsBangalore2011.
2	MikeMcgrath,–JavaScript‖,DreamTechPress2006,1stEdition.
3	AchyutSGodbole&AtulKahate,–WebTechnologies‖,2002,2ndEdition.
ReferenceBooks	
1.	LauraLemay,RafeColburn,JenniferKyrnin,–MasteringHTML,CSS&JavascriptWebPublishing‖,2016.
2.	DTEditorialServices(Author),–HTML5BlackBook(CoversCSS3,JavaScript,XML,XHTML,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	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	PHPPROGRAMMING	Specific Elective	2				2	2	25	75	100

CourseObjective	
LO1	Toprovidethenecessaryknowledgeonbasicsof PHP.
LO2	Todesignanddevelopdynamic,database-drivenwebapplicationsusingPHPversion.
LO3	Togetanexperience onvariouswebapplicationdevelopmenttechniques.
LO4	Tolearnthenecessaryconceptsforworkingwiththefilesusing PHP.
LO5	Togetaknowledgeon OOPSwithPHP.

UNIT	**Details**	**No.of Hours**
I	IntroductiontoPHP-BasicKnowledgeofwebsites-IntroductionofDynamicWebsite-IntroductiontoPHP-ScopeofPHP-XAMPP and WAMPInstallation	6
II	PHPProgrammingBasics-SyntaxofPHP-EmbeddingPHPinHTML-EmbeddingHTMLinPHP. Introduction to PHP Variable -Understanding Data Types -UsingOperators -Using Conditional Statements -If(), else if() and else ifconditionStatement.	6
III	Switch()Statements-Usingthewhile()Loop-Usingthefor()LoopPHPFunctions. PHPFunctions-CreatinganArray-ModifyingArrayElements-ProcessingArrayswithLoops-GroupingFormSelectionswith Arrays-UsingArrayFunctions.	6
IV	PHPAdvancedConcepts -ReadingandWriting Files -Reading Data fromaFile.	6
V	ManagingSessionsandUsingSessionVariables-DestroyingaSession-StoringDatainCookies-SettingCookies.	6
	Total	**30**

CourseOutcomes		**ProgrammeOutcomes**
CO	Oncompletionofthiscourse,studentswill	
1	WritePHPscriptstohandleHTMLforms	PO1,PO4,PO6,PO8.
2	Writeregularexpressionsincludingmodifiers,operators,andmetacharacters.	PO2,PO5,PO7.
3	CreatePHP Programusingtheconceptof array.	PO3,PO6,PO8.
4	CreatePHPprogramsthatusevariousPHP	PO2,PO3,PO5,PO8.

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

MappingwithProgrammeOutcomes:

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

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

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

CourseObjective	
LO1	Tostudyfundamentalconceptsinsoftwaretesting
LO2	Todiscussvarious softwaretestingissuesandsolutionsinsoftwareunittest,integrationandsystemtesting.
LO3	TostudythebasicconceptofDataflowtestingandDomaintesting.
LO4	ToAcquireknowledgeonpathproductsandpathexpressions.
LO5	TolearnaboutLogicbasedtestinganddecisiontables

UNIT	Details	No.ofHours
I	Introduction: Purpose–Productivity and Quality in Software–Testing Vs Debugging–Modelfor Testing–Bugs–TypesofBugs–TestingandDesignStyle.	6
II	Flow / Graphs and Path Testing – Achievable paths – PathinstrumentationApplicationTransactionFlowTestingTechniques.	6
III	DataFlowTestingStrategies-DomainTesting:DomainsandPaths–DomainsandInterfaceTesting.	6
IV	Linguistic–Metrics–StructuralMetric – PathProductsandPathExpressions.SyntaxTesting–Formats–TestCases	6
V	Logic Based Testing–Decision Tables–TransitionTesting–States,StateGraph,StateTesting.	6
	Total	**30**

CourseOutcomes		ProgramOutcomes
CO	Oncompletionofthiscourse,studentswill	
1	Studentslearntoapplysoftwaretestingknowledgeandengineeringmethods	PO1
2	Haveanabilitytoidentifytheneedsof softwaretest	PO1,PO2

	automation,anddefineanddevelopatesttooltosupporttestautomation.	
3	Have an ability understand and identify various softwaretesting problems, and solve these problems by designingandselectingsoftwaretestmodels,criteria,strategies,andmethods.	PO4,PO6
4	Have basic understandingandknowledge of contemporary issues in software testing, such ascomponent-basedsoftwaretestingproblems	PO4,PO5,PO6
5	Have an ability to use software testing methods andmodernsoftwaretestingtoolsfortheirtestingprojects.	PO3,PO8
TextBook		
1	B.Beizer,–SoftwareTestingTechniques‖,IIEdn.,DreamTechIndia,NewDelhi,2003.	
2	K.V.K.Prasad,–SoftwareTestingTools‖,DreamTech.India,NewDelhi,2005	
ReferenceBooks		
1.	I.Burnstein,2003,–PracticalSoftwareTesting‖,SpringerInternationalEdn.	
2.	E.Kit,1995,—SoftwareTestingintheRealWorld:ImprovingtheProcess‖, PearsonEducation,Delhi.	
3.	R.Rajani,andP.P.Oak,2004,–SoftwareTesting‖,TataMcgrawHill,New Delhi.	
WebResources		
1.	https://www.javatpoint.com/software-testing-tutorial	
2.	https://www.guru99.com/software-testing.html	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**2**	**3**	**2**	**2**	**2**	**-**
CO2	**3**	**2**	**2**	**3**	**3**	**2**
CO3	**2**	**3**	**3**	**2**	**2**	**3**
CO4	**2**	**1**	**2**	**2**	**2**	**1**
CO5	**2**	**2**	**3**	**2**	**2**	**2**
Weightageofcoursecontributed to eachPSO	11	10	12	11	11	8

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	PROBLEM SOLVINGTECHNIQUES	Specific Elective	2	-	-	-	2	2	25	75	100

CourseObjective	
LO1	Understandthesystematicapproachtoproblemsolving.
LO2	Knowthe approachandalgorithmstosolve specificfundamentalproblems.
LO3	Understandtheefficientapproachtosolvespecificfactoring-related problems.
LO4	Understandtheefficientarray-relatedtechniquestosolvespecificproblems.
LO5	Understandtheefficientmethodstosolve specificproblemsrelatedtotextprocessing. Understandhowrecursionworks.

UNIT	**Details**	**No.of Hours**
I	**Introduction:** Notion of algorithms and programs – Requirements for solvingproblems by computer – The problem-solving aspect: Problem definition phase,Getting started on a problem, The use of specific examples, Similarities amongproblems,Workingbackwards from thesolution–Generalproblem-solvingstrategies-Problemsolvingusingtop-downdesign– Implementationofalgorithms–TheconceptofRecursion.	6
II	**Fundamental Algorithms**: Exchanging the values of two variables – Counting - Summationofasetofnumbers-Factorialcomputation-Sinefunctioncomputation - Fibonacci Series generation - Reversing the digits of an integer – BaseConversion.	6
III	**Factoring Methods**: Finding the square root of a number – The smallest divisorof an integer – Greatest common divisor of two integers - Generating primenumbers – Computing the prime factors of an integer – Generation of pseudo-random numbers -Raising a number to a large power– Computing the *n*thFibonaccinumber.	6
IV	**Array Techniques**: Array order reversal – Array counting or histograming – Finding the maximum number in a set - Removal of duplicates from an orderedarray-Partitioninganarray–Findingthek^{th}smallestelement– Longestmonotonesubsequence.	6
V	**Text Processing and Pattern Searching**: Text line length adjustment – Left andright justification of text – Keyword searching in text – Text line editing – Linearpatternsearch. **Recursivealgorithms**: TowersofHanoi–Permutationgeneration.	6

	Total	30

CourseOutcomes		ProgrammeOutcome
CO	Oncompletionofthiscourse,studentswill	
1	Understand the logic of problem and analysesimplementationofalgorithmandTopDownapproach andconceptof Recursion	PO1,PO6
2	Able tounderstandtheSequence ofNumbersandSeries Fibonacci,Reversing,BaseConversion.	PO2
3	AbletodoAlgebraicoperations	PO2,PO4
4	Coverageof ArraysanditsLogics	PO6,PO8
5	TextProcessingandPatternSearchingApproach	PO7
TextBook		
1	R.G.Dromey,*HowtoSolveitbyComputer*,PearsonIndia,2007	
ReferenceBooks		
1.	George Polya, Jeremy Kilpatrick, *The Stanford Mathematics Problem Book: With Hints andSolutions*,DoverPublications,2009(KindleEdition2013).	
2.	GregW. Scragg,*ProblemSolvingwithComputers*,Jones&Bartlett1stedition, 1996.	
WebResources		
1.	https://www.studytonight.com/	
2.	https://www.w3schools.com/	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**2**	**3**	**1**	**2**	**1**	**2**
CO2	**2**	**2**	**2**	**1**	**3**	**1**
CO3	**3**	**2**	**1**	**2**	**3**	**3**
CO4	**2**	**2**	**3**	**2**	**3**	**3**
CO5	**2**	**3**	**1**	**2**	**3**	2
Weightageofcourse contributedtoeach PSO	11	12	8	9	13	11

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	OFFICEAUTOMATION	Specific Elective	2	-	-	-	2	2	25	75	100

CourseObjective	
LO1	Understandthebasicsofcomputersystemsanditscomponents.
LO2	Understandandapplythe basicconceptsofawordprocessingpackage.
LO3	Understandandapplythe basicconceptsofelectronicspreadsheet software.
LO4	Understandandapplythebasicconceptsofdatabasemanagement system.
LO5	UnderstandandcreateapresentationusingPowerPointtool.

UNIT	Details	No. ofHours
I	**Introductory concepts:** Memory unit– CPU-Input Devices: Key board, MouseandScanner.Outputdevices:Monitor,Printer.IntroductiontoOperatingsystems&itsfeatures:DOS– UNIX–Windows.IntroductiontoProgrammingLanguages.	6
II	**Word Processing:** Open, Save and close word document; Editing text – tools,formatting,bullets;SpellChecker-Documentformatting– Paragraphalignment,indentation,headersandfooters,numbering ;printing–Preview,options,merge.	6
III	**Spreadsheets:**Excel– opening,enteringtextanddata,formatting,navigating;Formulas– entering,handlingand copying; Charts–creating, formatting andprinting,analysistables,preparationoffinancialstatements,introductiontodataanalytics.	6
IV	**Database Concepts:** The concept of data base management system; Datafield, records,andfiles,Sortingandindexingdata;Searchingrecords.Designingqueries,andreports;Linkingofdatafiles;UnderstandingProgramming environment in DBMS; Developing menu drive applicationsinquerylanguage(MS–Access).	6
V	**Power point:** Introduction to Power point - Features – Understanding slidetypecasting&viewingslides–creatingslideshows.Applyingspecialobject – including objects & pictures – Slide transition–Animation effects,audioinclusion ,timers.	6
	Total	**30**

CourseOutcomes		ProgrammeOutcomes
CO	Oncompletionofthiscourse,studentswill	
1	Possess the knowledge on the basics of computers and itscomponents	PO1,PO2,PO3,PO6,PO8
2	GainknowledgeonCreatingDocuments,spreadsheetand presentation.	PO1,PO2,PO3,PO6

3	LearntheconceptsofDatabaseandimplementtheQuery inDatabase.	PO3,PO5,PO7
4	Demonstratetheunderstandingofdifferentautomation tools.	PO3,PO4,PO5,PO7
5	Utilizetheautomationtoolsfordocumentation,calculatio nandpresentationpurpose.	PO4,PO6,PO7,PO8
TextBook		
1	PeterNorton,–IntroductiontoComputers‖–TataMcGraw-Hill.	
ReferenceBooks		
1.	JenniferAckermanKettel,GuyHat-Davis,CurtSimmons,–Microsoft2003‖,Tata McGrawHill.	
WebResources		
1.	https://www.udemy.com/course/office-automation-certificate-course/	
2.	https://www.javatpoint.com/automation-tools	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**2**	**2**	**2**	**3**	**3**	**1**
CO2	**3**	**1**	**2**	**3**	**3**	**3**
CO3	**3**	**2**	**1**	**2**	**1**	**3**
CO4	**3**	**3**	**2**	**2**	**2**	**1**
CO5	**2**	**2**	**1**	**3**	**1**	**3**
Weightageofcourse contributedtoeach PSO	13	10	8	13	10	11

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	QuantitativeAptitude	Specific Elective	2	-	-	-	2	2	25	75	100

CourseObjective	
LO1	Tounderstandthebasicconceptsofnumbers
LO2	Understandandapplytheconceptofpercentage,profit&loss
LO3	Tostudythebasicconceptsoftimeandwork,interests
LO4	Tolearntheconceptsofpermutation,probability,discounts
LO5	Tostudyabouttheconceptsofdatarepresentation,graphs

UNIT	**Details**	**No.of Hours**
I	Numbers-HCFandLCMof numbers-Decimalfractions-Simplification-Squarerootandcuberoots-Average-problemsonNumbers.	6
II	ProblemsonAges-SurdsandIndices- percentage -profitsand loss - ratioandproportion-partnership-Chainrule.	6
III	Timeandwork-pipesandcisterns-TimeandDistance - problemsontrains-Boatsandstreams-simpleinterest - compoundinterest-Logarithms-Area-Volumeandsurfacearea-racesandGamesofskill.	6
IV	Permutation and combination-probability-TrueDiscount-BankersDiscount– Height andDistances-Oddmanout&Series.	6
V	Calendar-Clocks-stocksand shares- Datarepresentation-Tabulation– Bar Graphs- Pie charts-Linegraphs.	6
	Total	**30**

CourseOutcomes		**ProgrammeOutcome**
CO	Oncompletionofthiscourse,studentswill	
1	understandtheconcepts,applicationandthe problemsofnumbers	PO1
2	To have basic knowledge and understanding about percentage,profit&lossrelatedprocessings	PO1,PO2

3	To understandtheconceptsoftimeandwork	PO4,PO6
4	Speaksabouttheconceptsofprobability,discount	PO4,PO5,PO6
5	Understanding the concept of problem solving involved in stocks& shares,graphs	PO3,PO8
TextBook		
1	–QuantitativeAptitude‖,R.S.AGGARWAL.,S.Chand&CompanyLtd.,	
ReferenceBooks		
1.		
WebResources		
1.	https://www.javatpoint.com/aptitude/quantitative	
2.	https://www.toppr.com/guides/quantitative-aptitude/	

MappingwithProgrammeOutcomes:

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

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
SKILLENHANCEMENT COURSE	**OpenSourceSoftware Technologies**	SkillEnha. Course	2	-	-	-	2	2	25	75	100

CourseObjective	
LO1	AbletoAcquireandunderstandthebasicconceptsinJava,applicationofOOPSconcepts.
LO2	Acquireknowledgeaboutoperatorsanddecision-makingstatements.
LO3	ToIdentifythesignificanceandapplicationofClasses,arraysandinterfacesand analyzingjavaarrays
LO4	UnderstandabouttheapplicationsofOOPSconceptsandanalyzeoverridingand packagesthroughjavaprograms.
LO5	CanCreatewindow-based programmingusingappletand graphicsprogramming.

UNIT	Details	No. ofHours
I	OpenSource–opensourcevs.commercialsoftware–WhatisLinux –FreeSoftware–WhereIcanuseLinux -Linuxkernel– Linuxdistributions.	6
II	: Introduction Linux Essential Commands –File System concept – Standard Files –The Linux Security Model – Introduction to Unix – UnixComponentsUnixFiles–FileAttributesandPermission– StandardI/O–Redirection– PipesandFilters–GrepandStreamEditor	6
III	Introduction - Apache Explained – Starting, Stopping and RestartingApache –Modifying the Default configuration – Securing Apache – SetuserandGroup	6
IV	**UNIT IV: MySQL:** Introduction to MySQL – The show databases andtable – The USE command –Create Database and Tables – DescribeTable–Select,Insert, UpdateandDeletestatementdatabase.	6
V	• I**ntroduction** –PHP Form processing – Database Access withPHP–MySQL,MySQLFunctions–InsertingRecords– SelectingRecords–DeletingRecords–UpdateRecords.	6
	Total	**30**

CourseOutcomes		**ProgrammemeOutcomea**
CO	Oncompletionofthiscourse, studentswill	
1	Acquireandunderstandthebasicconceptsin	Po1

	Java,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
TextBook		
1	1.JamesLeeandBrentWare–OpenSourceWebDevelopmentwithLAMP using	
2	2.LINUX,Apache,MySQL,PerlandPHP‖,DorlingKindersley(India)Pvt.Ltd,2008.	
ReferenceBooks		
1.	EricRosebrock,EricFilson,–SettingupLAMP:GettingLinux,Apache,MySQLand PHPand workingtogether‖,JohnWileyandSons,2004.	
2.	2.AnthonyButcher,–TeachYourselfMySQLin21days‖,2ndEdition,SamsPublication.	
3.	3.RichBower,DanielLopezRidreejo,AlianLiska,–ApacheAdministrator‘s Handbook‖,Sams Publication.	
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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	MultimediaSystems	Specific Elective	2	-	-	-	2	2	25	75	100

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

UNIT	Details	No.of Hours
I	Multimedia Definition-Use Of Multimedia-Delivering Multimedia- Text: About Fonts andFaces-UsingTextinMultimedia -Computers andText Font Editing and Design Tools-Hypermedia andHypertext.	6
II	Images:PlanApproach-OrganizeTools-ConfigureComputerWorkspace-MakingStill Images-Color -ImageFileFormats.Sound:ThePowerofSound-DigitalAudio-MidiAudio-Midivs.DigitalAudio-MultimediaSystemSounds Audio File Formats - Vaughan'sLawofMultimediaMinimums-AddingSoundtoMultimediaProject	6
III	Animation:ThePowerofMotion-PrinciplesofAnimation-AnimationbyComputer-MakingAnimationsthatWork. Video: Using Video -WorkingwithVideoandDisplays-DigitalVideoContainers-ObtainingVideoClips-ShootingandEditingVideo	6
IV	Making Multimedia:TheStageof Multimedia Project-The Intangible Needs -The Hardware Needs - The SoftwareNeeds-AnAuthoringSystemsNeeds-Multimedia ProductionTeam.	6
V	Planning andCosting:The ProcessofMakingMultimedia-Scheduling-Estimating-RFPsandBidProposals.Designing and Producing- ContentandTalent:AcquiringContent-OwnershipofContentCreatedforProject-AcquiringTalent	6
	Total	**30**

CourseOutcomes		ProgrammeOutcomes
CO	Oncompletionofthiscourse,studentswill	
1	understand the concepts, importance, application and theprocessof developingmultimedia	PO1

2	tohave basicknowledgeandunderstandingaboutimagerelatedprocessings	PO1,PO2
3	Tounderstand theframeworkoframesand bitimagestoanimations	PO4,PO6
4	Speaksaboutthemultimediaprojectsandstagesofrequirementinphasesofproject.	PO4,PO5,PO6
5	Understanding the concept of cost involved in multimediaplanning,designing,andproducing	PO3,PO8
TextBook		
1	TayVaughan,"Multimedia:MakingItWork",8thEdition,Osborne/McGraw-Hill,2001.	
ReferenceBooks		
1.	RalfSteinmetz&KlaraNahrstedt"MultimediaComputing,Communication&Applications",PearsonEducation,2012.	
WebResources		
1.	https://www.geeksforgeeks.org/multimedia-systems-with-features-or-characteristics/	

MappingwithProgrammeOutcomes:

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

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	Advanced Excel	Specific Elective	2	-	-	-	2	2	25	75	100
CourseObjective											
LO1	Handlelargeamountsofdata										
LO2	Aggregatenumericdata andsummarizeintocategoriesandsubcategories										
LO3	Filtering,sorting,andgroupingdataorsubsetsofdata										
LO4	Createpivottablestoconsolidatedatafrommultiplefiles										
LO5	Presentingdataintheformofchartsandgraphs										

UNIT	Details	No. ofHours
I	Basics of Excel-Customizing common options-Absoluteand relative cells-Protecting and un-protecting worksheetsandcells-Working with Functions-Writing conditionalexpressions-logicalfunctions-lookupandreferencefunctions-VlookUPwithExactMatch,ApproximateMatch-Nested VlookUP with Exact Match-VlookUP withTables,DynamicRanges-NestedVlookUPwithExactMatch-Using VLookUP to consolidate Data from MultipleSheets	6
II	DataValidations-Specifyingavalidrangeofvalues-Specifyingalistofvalidvalues-Specifyingcustomvalidationsbasedonformula-WorkingwithTemplatesDesigningthestructureofatemplate-templatesforstandardization of worksheets - Sorting and Filtering Data -Sortingtables-multiple-levelsorting-customsorting-Filtering data for selected view -advanced filter options-Working with ReportsCreating subtotals-Multiple-levelsubtotal.	6
III	CreatingPivottables FormattingandcustomizingPivot tables- advancedoptionsofPivottables- Pivotcharts-	6

	ConsolidatingdatafrommultiplesheetsandfilesusingPivottables-externaldatasources-dataconsolidationfeature to consolidate data-Show ValueAs % of Row,%of Column, Running Total, Compare with Specific Field-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.	6
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.	6
	Total	**30**

CourseOutcomes		**ProgrammeOutcomes**
CO	Oncompletionofthiscourse,studentswill	
1	Workwithbigdatatoolsanditsanalysistechniques.	PO1
2	Analyzedatabyutilizingclusteringandclassificationalgorithms.	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**
ReferenceBooks	
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 contributedtoeach PSO	14	11	8	9	8	10

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	Biometrics	Specific Elective	2	-	-	-	2	2	25	75	100

Course Objectives	
LO1	Identifythevariousbiometrictechnologies.
LO2	Designofbiometric recognition.
LO3	Developsimpleapplicationsforprivacy
LO4	Understandtheneedofbiometricinthesociety
LO5	Understandthescopeofbiometrictechniques

UNIT	**Details**	**No. ofHours**
I	**Introduction**:WhatisBiometrics,History,TypesofbiometricTraits,Generalarchitectureofbiometricsystems, Basic working of biometric matching, Biometricsystemerrorandperformancemeasures,Designof biometric system, Applications of biometrics, Biometricsversustraditionalauthenticationmethods. **FaceBiometrics:**Introduction,BackgroundofFaceRecognition,DesignofFaceRecognitionSystem, Neural Network for Face Recognition, Face Detection inVideo Sequences,Challenges in Face Biometrics, .7 FaceRecognitionMethods,AdvantagesandDisadvantages.	6
II	**Retina and Iris Biometrics:** Introduction, Performance ofBiometrics,Design of Retina Biometrics,Design of IrisRecognitionSystem,IrisSegmentationMethod,Determination of Iris Region, Determination of Iris Region,ApplicationsofIrisBiometrics,AdvantagesandDisadvantages **VeinandFingerprintBiometrics:**Introduction,BiometricsUsingVeinPatternofPalm,FingerprintBiometrics,FingerprintRecognitionSystem,MinutiaeExtraction,FingerprintIndexing, ExperimentalResults,AdvantagesandDisadvantages.	6

III	**PrivacyEnhancementUsingBiometrics:** Introduction,Privacy Concerns Associated with Biometric Deployments,Identity and Privacy, Privacy Concerns,Biometrics withPrivacy Enhancement,Comparison of Various BiometricsinTermsof Privacy,SoftBiometrics. **MultimodalBiometrics:** IntroductiontoMultimodalBiometrics , Basic Architecture of Multimodal Biometrics,Multimodal Biometrics Using Face and Ear, Characteristicsand Advantages of Multimodal Biometrics, CharacteristicsandAdvantagesof MultimodalBiometrics.	6
IV	**WatermarkingTechniques:** Introduction,DataHidingMethods,BasicFrameworkofWatermarking,ClassificationofWatermarking,ApplicationsofWatermarking,AttacksonWatermarks,PerformanceEvaluation,CharacteristicsofWatermarks,GeneralWatermarking Process, Image Watermarking Techniques,Watermarking Algorithm, Experimental Results, Effect ofAttacks on Watermarking Techniques, Attacks on SpatialDomainWatermarking.	6
V	**ScopeandFuture:** ScopeandFutureMarketofBiometrics,BiometricTechnologies,ApplicationsofBiometrics,BiometricsandInformationTechnologyInfrastructure, Role of Biometrics in Enterprise Security,RoleofBiometricsinBorderSecurity,SmartCardTechnologyandBiometrics,RadioFrequencyIdentification(RFID)Biometrics,DNABiometrics,ComparativeStudyof VariousBiometricTechniques. **BiometricStandards:** Introduction,StandardDevelopmentOrganizations,ApplicationProgrammingInterface(API),InformationSecurityandBiometricStandards,BiometricTemplateInteroperability.	6
	Total	**30**

CourseOutcomes		
Course Outcomes	Oncompletionofthiscourse,studentswill;	
CO1	Tounderstandthebasicconceptsandthefunctionalityof theBiometrics,FaceBiometrics,Types,ArchitectureandApplications.	PO1,PO3,PO6, PO8
CO2	ToknowtheconceptsRetinaandIrisBiometricsandVein	PO1,PO2,PO3,PO6

	andFingerprintBiometrics.	
CO3	ToanalysethePrivacyEnhancementandMultimodalBiometrics.	PO3,PO5
CO4	Togetanalyticalidea onWatrmarkingTechniques	PO1,PO2,PO3, PO7
CO5	ToGainknowledgeonFuturescopeofBiometrics,and StudyofvariousBiometricTechniques.	PO2,PO6,PO7
RecommendedText		
1.	Biometrics: ConceptsandApplicationsbyG.R Sinha andSandeepB.Patil,Wiley,2013	
ReferencesBooks		
1.	Guide to Biometrics by Ruud M. Bolle , SharathPankanti, Nalinik.Ratha, AndrewW.Senior,JonathanH.Connell,Springer2009	
2.	IntroductiontoBiometricsbyAnilk.Jain,ArunA.Ross,KarthikNandakumar	
3.	HandbookofBiometricsbyAnilK. Jain,PatrickFlynn, ArunA.Ross.	
WebResources		
1.	https://www.tutorialspoint.com/biometrics/index.htm	
2.	https://www.javatpoint.com/biometrics-tutorial	
3.	https://www.thalesgroup.com/en/markets/digital-identity-and-security/government/inspired/biometrics	

MappingwithProgrammeOutcomes:

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

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	CyberForensics	Specific Elective	2	-	-	-	2	2	25	75	100
CourseObjective											
LO1	Understandthedefinitionofcomputerforensicsfundamentals.										
LO2	TostudyabouttheTypesofComputerForensicsEvidence										
LO3	Understandandapplytheconceptsof DuplicationandPreservationofDigitalEvidence										
LO4	Understandthe conceptsofElectronic EvidenceandIdentificationofData										
LO5	TostudyabouttheDigitalDetective,NetworkForensicsScenario, DamagingComputer Evidence.										
UNIT	**Details**							**No.of Hours**			
I	**OverviewofComputerForensicsTechnology:**ComputerForensicsFundamentals:WhatisComputerForensics UseofComputerForensicsinLawEnforcement, Computer Forensics Assistance to HumanResources/Employment Proceedings, Computer ForensicsServices, Benefits of professional Forensics Methodology,Steps taken by Computer Forensics Specialists. Types ofComputer.ForensicsTechnology:TypesofBusinessComputerForensic,Technology– TypesofMilitaryComputerForensicTechnology– TypesofLawEnforcement– ComputerForensic.Technology–Typesof BusinessComputerForensic Technology.							6			
II	**ComputerForensicsEvidenceandcapture:**DataRecovery: DataRecoveryDefined,DataBack–upandRecovery, The Role of Back –up in Data Recovery, TheData –Recovery Solution. Evidence Collection and DataSeizure:CollectionOptions,Obstacles,TypesofEvidence,TheRulesofEvidence,VolatileEvidence,General Procedure, Collection and Archiving, Methods ofCollections,Artefacts,CollectionSteps,Controlling Contamination:Thechainofcustody.							6			

III	**DuplicationandPreservationofDigitalEvidence:**Processingsteps,LegalAspectsofcollectingandPreserving Computer forensic Evidence. Computer imageVerificationandAuthentication:SpecialneedsofEvidentialAuthentication,PracticalConsideration,PracticalImplementation.	6
IV	**Computer Forensics Analysis:** Discovery of ElectronicEvidence: ElectronicDocument Discovery: A PowerfulNew Litigation Tool. Identification of Data: Time Travel,ForensicIdentificationandAnalysisofTechnical SurveillanceDevices.	6
V	**Reconstructing Past Events:** How to Become a DigitalDetective, Useable File Formats, Unusable File Formats,Converting Files. Networks: Network Forensics Scenario,a technical approach, Destruction Of E–Mail, DamagingComputerEvidence,DocumentingTheIntrusionon Destructionof Data,SystemTesting.	6
	Total	**30**
CourseOutcomes		**ProgrammeOutcomes**
CO	Oncompletionofthiscourse,studentswill	
1	Understand the definition of computer forensicsfundamentals.	PO1
2	Evaluatethedifferenttypesofcomputerforensicstechnology.	PO1,PO2
3	Analyzevariouscomputerforensicssystems.	PO4,PO6
4	Apply the methods for data recovery, evidence collectionanddataseizure.	PO4,PO5,PO6
5	Gain your knowledge of duplication and preservation ofdigitalevidence.	PO3,PO8
TextBook		
1	JohnR.Vacca,–ComputerForensics:ComputerCrimeInvestigation‖,3/E,FirewallMedia, NewDelhi,2002.	
ReferenceBooks		
1.	Nelson,PhillipsEnfinger,Steuart,–ComputerForensicsandInvestigations‖Enfinger,Steuart,	

	CENGAGELearning,2004.
2.	AnthonySammesandBrianJenkinson,‖ForensicComputing:APractitioner'sGuide‖,SecondEdition,Springer–VerlagLondonLimited,2007.
3.	.RobertM.Slade,‖SoftwareForensicsCollecting EvidencefromtheSceneofaDigitalCrime‖,TMH2005.
WebResources	
1.	https://www.vskills.in
2.	https://www.hackingarticles.in/best-of-computer-forensics-tutorials/

MappingwithProgrammeOutcomes:

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

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	PatternRecognition	Specific Elective	2	-	-	-	2	2	75	25	100

CourseObjective	
LO1	Tolearnthefundamentalsof PatternRecognitiontechniques
LO2	TolearnthevariousStatisticalPatternrecognitiontechniques
LO3	Tolearnthelineardiscriminantfunctionsandunsupervisedlearningandclustering
LO4	TolearnthevariousSyntacticalPatternrecognitiontechniques
LO5	TolearntheNeuralPatternrecognitiontechniques

UNIT	Details	No.of Hours
I	**PATTERNRECOGNITIONOVERVIEW**:Pattern recognition, Classification and Description-Patterns andfeatureExtractionwithExamples-TrainingandLearningin PR systems-PatternrecognitionApproaches	6
II	**STATISTICALPATTERNRECOGNITION**: Introduction to statistical Pattern Recognition-supervisedLearningusingParametricandNon-ParametricApproaches.	6
III	**LINEAR DISCRIMINANT FUNCTIONS ANDUNSUPERVISEDLEARNINGANDCLUSTERING**: Introduction-Discrete and binary Classification Problems-Techniques to directly Obtain linear Classifiers - FormulationofUnsupervisedLearningProblems-Clustering forunsupervisedlearningandclassification	6
IV	**SYNTACTICPATTERNRECOGNITION**:Overviewof Syntactic Pattern Recognition-Syntactic recognition viaparsing and other grammars–Graphical Approaches tosyntacticpatternrecognition-Learningvia grammatical inference.	6
V	**NEURAL PATTERN RECOGNITION**: Introduction toNeural Networks-Feed-forward Networks and training byBackPropagation-Content AddressableMemoryApproaches andUnsupervisedLearninginNeuralPR	6
	Total	30

CourseOutcomes		**ProgrammeOutcomes**
CO	Oncompletionofthiscourse,studentswill	
1	understandtheconcepts,importance,applicationandthe processof developingPatternrecognitionoverview	PO1

2	tohave basicknowledgeandunderstandingabout parametricand non-parametricrelated concepts.	PO1,PO2

3	Tounderstand theframework offramesandbit imagesto animations	PO4,PO6
4	Speaksaboutthemultimediaprojectsandstagesof requirementinphasesofproject.	PO4,PO5,PO6
5	Understandingtheconceptofcostinvolvedinmultimedia planning,designing,andproducing	PO3,PO8
TextBook		
1	RobertSchalkoff,–PatternRecognition:StatisticalStructuralandNeuralApproaches‖,John wiley&sons.	
2	DudaR.O.,P.E.Hart&D.GStork,—PatternClassification‖,2ndEdition,J.Wiley.	
3	DudaR.O.&HartP.E.,–PatternClassificationandSceneAnalysis‖,J.wiley.	
4	BishopC.M.,–NeuralNetworksforPatternRecognition‖,OxfordUniversityPress.	
ReferenceBooks		
1.	1.EarlGose,Richardjohnsonbaugh,SteveJost,–PatternRecognitionandImageAnalysis‖, PrenticeHallofIndia,PvtLtd,NewDelhi.	
WebResources		
1.	https://www.geeksforgeeks.org/pattern-recognition-introduction/	
2.	https://www.mygreatlearning.com/blog/pattern-recognition-machine-learning/	

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**2**	**3**	**1**	**2**	**-**	**2**
CO2	**2**	**2**	**2**	**3**	**3**	**1**
CO3	**3**	**2**	**-**	**3**	**2**	**3**
CO4	**3**	**3**	**3**	**2**	**3**	**3**
CO5	**2**	**3**	**1**	**2**	**3**	2
Weightageofcoursecontributedtoeach PSO	12	13	7	12	11	11

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	ERP	Specific Elective	2	-	-	-	2	2	25	75	100

Course Objectives	
LO1	TounderstandthebasicconceptsEvolutionandBenefitsofERP.
LO2	ToknowtheneedandRoleofERPinlogicalandPhysicalIntegration.
LO3	Identifytheimportantbusiness functionsprovidedbytypicalbusinesssoftwaresuch asenterpriseresourceplanningandcustomerrelationshipmanagement
LO4	Totrainthestudentstodevelopthebasicunderstandingofhow ERPenrichesthe businessorganizationsinachievingamultidimensionalgrowth
LO5	Toaimatpreparingthestudentstechnologicalcompetitiveandmakethemreadyto self-upgrade withthehighertechnicalskills

UNIT	Details	No. ofHours
I	ERP Introduction, Benefits, Origin, Evolution and Structure:ConceptualModelofERP,theEvolutionofERP,theStructureofERP,ComponentsandneedsofERP,ERP Vendors;Benefits&LimitationsofERPPackages.	6
II	Need to focus on Enterprise Integration/ERP; Informationmapping;RoleofcommonsharedEnterprisedatabase;System Integration, Logical vs. Physical System Integration,Benefits & limitations of System Integration, ERP's Role inLogicalandPhysicalIntegration.BusinessProcessReengineering,DatawareHousing,DataMining,OnlineAnalyticProcessing(OLAP),ProductLifeCycleMan-agement(PLM),LAP,SupplychainManagement.	6
III	ERPMarketplaceandMarketplaceDynamics:MarketOverview,MarketplaceDynamics,theChangingERPMarket. ERP-Functional Modules: Introduction, FunctionalModules of ERP Software, Integration of ERP, Supply chainand Customer Relationship Applications. Cloud and OpenSource,QualityManagement,MaterialManagement, FinancialModule,CRMandCaseStudy.	6
IV	ERPImplementationBasics,,ERPimplementationStrategy,ERPImplementationLifeCycle,Pre-Implementationtask,RoleofSDLC/SSAD,ObjectOriented Architecture,Consultants, VendorsandEmployees.	6
V	ERP&E-Commerce,FutureDirectives-inERP,ERPand	6

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

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

ReferenceText:	
1.	EnterpriseResourcePlanning–AlexisLeon,TataMcGrawHill.
References:	
1.	Enterprise ResourcePlanning–DiversifiedbyAlexisLeon,TMH.
2.	EnterpriseResourcePlanning–RaviShankar&S.Jaiswal,Galgotia
WebResources	
1.	1.https://www.tutorialspoint.com/management_concepts/enterprise_resource_planning.htm
2.	1.https://www.saponlinetutorials.com/what-is-erp-systems-enterprise-resource-planning/
3.	1.https://www.guru99.com/erp-full-form.html
4.	2.https://www.oracle.com/in/erp/what-is-erp/

MappingwithProgrammeOutcomes:

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

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	RoboticsandIts Applications	Specific Elective	2	-	-	-	2	2	25	75	100
CourseObjective											
LO1	Tounderstandtheroboticsfundamentals										
LO2	Understandthesensorsandmatrixmethods										
LO3	UnderstandtheLocalization:Self-localizationsandmapping										
LO4	TostudyabouttheconceptofPathPlanning,Visionsystem										
LO5	Tolearnabouttheconceptofrobotartificialintelligence										

UNIT	Details	No.of Hours
I	Introduction:Introduction,briefhistory,componentsofrobotics, classification, workspace, work-envelop, motion ofrobotic arm, end-effectors and its types, service robot and itsapplication,ArtificialIntelligenceinRobotics.	6
II	Actuatorsandsensors:Typesofactuators,stepper-DC-servo-andbrushless motors-modelof a DC servo motor-typesoftransmissions-purposeofsensor-internalandexternal sensor-common sensors-encoders tachometers-straingaugebasedforcetorquesensor-proximityanddistancemeasuringsensors Kinematics of robots: Representation of joints and frames,framestransformation,homogeneousmatrix,D-Hmatrix,Forward and inverse kinematics: two link planar (RR) andspherical robot (RRP). Mobile robot Kinematics: Differentialwheelmobilerobot	6
III	Localization: Self-localizations and mapping - Challenges inlocalizations–IRbasedlocalizations–visionbasedlocalizations–Ultrasonicbasedlocalizations-GPSlocalizationsystems.	6
IV	PathPlanning:Introduction,pathplanning-overview-road map path planning-cell decomposition path planning	6

	potential fieldpathplanning-obstacleavoidance-case studies Vision system: Roboticvisionsystems-imagerepresentation-objectrecognition-andcategorization-depthmeasurement-imagedatacompression-visualinspection-softwareconsiderations	
V	Application:Arielrobots-collisionavoidancerobotsforagriculture-mining-exploration-underwater-civilian-andmilitary applications-nuclear applications-spaceApplications-Industrialrobots-artificialintelligenceinrobots-application of robots in material handling-continuousarc welding-spot welding-spray painting-assembly operation-cleaning-etc.	6
	Total	30

CourseOutcomes		**ProgrammeOutcomes**
CO	Oncompletionofthiscourse,studentswill	
1	Describethedifferentphysicalformsofrobot architectures.	PO1
2	Kinematicallymodelsimplemanipulatorand mobile robots.	PO1,PO2
3	Mathematicallydescribeakinematicrobotsystem	PO4,PO6
4	Analyzemanipulationand navigationproblemsusingknowledgeofcoordinateframes,kinematics, optimization,control,anduncertainty.	PO4,PO5,PO6
5	Programroboticsalgorithmsrelatedtokinematics, control,optimization,anduncertainty.	PO3,PO8

TextBook	
1	RicharedD.Klafter.ThomasAchmielewskiandMickaelNegin,RoboticEngineeringandIntegratedApproach,PrenticeHallIndia-Newdelhi-2001
2	SaeedB.Nikku,Introductiontorobotics,analysis,controland applications,Wiley-India,2 nd edition2011
ReferenceBooks	
1.	Industrial robotic technology-programming and application by M.P.Groover et.al, McGrawhill2008
2.	RoboticstechnologyandflexibleautomationbyS.R.Deb,THH-2009
WebResources	
1.	https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_robotics.htm
2.	https://www.geeksforgeeks.org/robotics-introduction/

MappingwithProgrammeOutcomes:

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

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

SubjectCode	SubjectName	Category	L	T	P	S	Credits	Inst.Hours	Marks		
									CIA	External	Total
	SimulationandModeling	Specific Elective	2	-	-	-	2	2	25	75	100

Course Objectives	
LO1	Generates computer simulation technologies andtechniques,lays thegroundworkforstudents to comprehend computer simulation requirements, and implements and tests avariety of simulation and data analysis libraries and programmes. This course focuses onwhatisrequiredtocreatesimulationsoftwareenvironmentsratherthanjustsimulations usingpre-existingpackages
LO2	Discusstheconceptsofmodellinglayersof criticalinfrastructurenetworksinsociety.
LO3	Createtoolsforviewingandcontrollingsimulationsandtheirresults.
LO4	UnderstandtheconceptofEntitymodelling,Pathplanning
LO5	TolearnabouttheAlgorithmsandModelling.

LO1	**Details**	**No.ofHours**
I	IntroductionToModeling&Simulation–WhatisModeling and Simulation– Complexity Types – ModelTypes – Simulation Types – M&S Terms and DefinitionsInput Data Analysis – Simulation Input Modeling – InputData Collection- DataCollection Problems - – InputModelingStrategy-Histograms-Probability Distributions-SelectingaProbabilityDistribution.	6
II	RandomVariateGeneration–RandomNumbers– RandomNumberGenerators–Generalprinciples– InverseTransformMethod–AcceptanceRejectionMethod– CompositionMethod–RelocateandRescaleMethod - Specific distributions-Output Data Analysis – Introduction-TypesofSimulationWithRespecttoOutput Analysis - Stochastic Process and Sample Path - SamplingandSystematicErrors-Mean,StandardDeviation and Confidence Interval - Analysis of Finite-Horizon Simulations - Single Run - Independent Replications-SequentialEstimation–Analysisof	6

	Steady-StateSimulations-RemovalofInitializationBias (Warm-upInterval)-Replication-DeletionApproach-Batch-MeansMethod.	
III	ComparingSystemsviaSimulation–Introduction–ComparisonProblems-ComparingTwoSystems-Screening Problems - Selecting the Best - Comparisonwith a Standard - Comparison with a Fixed PerformanceDiscrete Event Simulations – Introduction - Next-EventTime Advance - Arithmetic and Logical Relationships -Discrete-EventModelingApproaches–Event-SchedulingApproach–ProcessInteractionApproach.	6
IV	Entity Modeling – Entity Body Modeling – Entity BodyVisualization–EntityBodyAnimation–EntityInteraction Modeling–Building Modeling DistributedSimulation–HighLevelArchitecture(HLA)–FederationDevelopmentandExecutionProcess(FEDEP)–SISORPRFOMBehaviorModeling–GeneralAIAlgorithms-DecisionTrees-NeuralNetworks - Finite State Machines - Logic Programming - ProductionSystems–PathPlanning-Off-LinePathPlanning - Incremental Path Planning - Real-Time PathPlanning–ScriptProgramming-ScriptParsing-Script Execution.	6
V	OptimizationAlgorithms–GeneticAlgorithms–SimulatedAnnealingExamples:SensorSystemsModeling–HumanEyeModeling–OpticalSensor Modeling–RadarModeling.	6
	Total	**30**

CourseOutcomes		
Course Outcomes	Oncompletionofthiscourse,studentswill;	**ProgrammeOutcomes**
CO1	IntroductionToModeling&Simulation,InputData AnalysisandModeling.	PO1

CO2	RandomVariateandNumberGeneration.Analysisof Simulationsandmethods.	PO1,PO2

CO3	ComparingSystemsviaSimulation	PO4,PO6
CO4	EntityBodyModeling,Visualization,Animation.	PO4,PO5,PO6
CO5	AlgorithmsandSensorModeling.	PO3,PO8
TextBooks		
1.	Jerry Banks, ―Handbook of Simulation: Principles, Methodology, Advances, Applications,andPractice‖,JohnWiley&Sons,Inc.,1998.	
2.	GeorgeS.Fishman,―Discrete-EventSimulation:Modeling,ProgrammingandAnalysis‖, Springer-VerlagNewYork,Inc.,2001.	
ReferencesBooks		
1.	AndrewF.Seila,VlatkoCeric,PanduTadikamalla,―AppliedSimulationModeling‖, ThomsonLearningInc.,2003.	
WebResources		
1.	https://www.tutorialspoint.com/modelling_and_simulation/index.htm	
2.	https://www.javatpoint.com/verilog-simulation-basics	

MappingwithProgrammeOutcomes:

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

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

SubjectCode	SubjectName	Category	L	T	P	O	Credits	Inst.Hours	Marks		
									CIA	External	Total
	OrganizationalBehaviour	Specific Elective	2	-	-	-	2	2	25	75	100

Learning Objectives	
LO1	TohaveextensiveknowledgeonOBandthescopeofOB.
LO2	TocreateawarenessofIndividualBenaviour.
LO3	ToenhancetheunderstandingofGroupBehaviour
LO4	ToknowthebasicsofOrganisaitonalCultureandOrganisationalStructure
LO5	TounderstandOrganisationalChange,ConflictandPower

UNIT	Details	No. ofHours
I	**INTRODUCTION**:ConceptofOrganizationalBehavior(OB):Nature,ScopeandRoleofOB:Disciplinesthatcontribute to OB; Opportunities for OB (Globalization, Indianworkforce diversity, customer service, innovation and change,networkedorganizations,work-lifebalance,peopleskills, positiveworkenvironment,ethics)	6
II	**INDIVIDUALBEHAVIOUR:** 1. Learning, attitude and Job satisfaction: Concept of learning,conditioning, shaping and reinforcement. Concept of attitude,components, behavior and attitude. Job satisfaction: causation;impactof satisfiedemployeesonworkplace. 2. Motivation : Concept; Theories (Hierarchy of needs, X andY, Two factor, McClelland, Goal setting, Self-efficacy, Equitytheory);Jobcharacteristicsmodel;Redesigningjobs, 3. Personality andValues : Conceptof personality; Myers-Briggs Type Indicator (MBTI); Big Five model. Relevance ofvalues;Linkingpersonalityandvaluestotheworkplace(person-jobfit,person-organizationfit) 4. Perception,DecisionMaking:PerceptionandJudgements; Factors;Linkingperceptiontoindividualdecisionmaking:	6
III	**GROUPBEHAVIOUR**:1.GroupsandWorkTeams:Concept: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	6

	theories(Fiedler,HerseyandBlanchard,Path-Goal);	
IV	ORGANISATIONALCULTURE AND STRUCTURE : Concept of culture; Impact (functions and liability); Creatingandsustainingculture:Conceptofstructure,Prevalentorganizationaldesigns:Newdesignoptions	6
V	ORGANISATIONALCHANGE,CONFLICTANDPOWER: Forcesofchange;Plannedchange;Resistance;Approaches(Lewin's model,Organisationaldevelopment);.Conceptofconflict,Conflictprocess;Types,Functional/Dysfunctional. Introductiontopowerandpolitics.	6
		30

Course Outcomes	OnCompletionofthecoursethestudentswill	**ProgramOutcomes**
CO1	To define OrganisationalBehaviour, Understand the opportunitythroughOB.	PO1,PO2,PO6, PO7
CO2	Toapplyself-awareness,motivation,leadershipandlearning theoriesatworkplace.	PO2,PO4. PO5,PO6
CO3	Toanalyzethecomplexitiesandsolutionsofgroupbehaviour.	PO1, PO2,PO4, PO5, PO6
CO4	Toimpactandbringpositivechangeintheculture ofthe organisaiton.	PO2,PO3,PO4PO5, PO8
CO5	Tocreateacongenialclimateintheorganization.	PO1,PO2,PO5PO6, PO8

ReadingList

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 Behaviour:ASkill-BuildingApproach,*SAGE Publications,Inc;2ndedition(29November2018).

ReferencesBooks

1.	UmaSekaran,OrganizationalBehaviourText&cases,2nd edition,TataMcGrawHill PublishingCO. Ltd
2.	GangadharRao,Narayana, V.S.PRao,OrganizationalBehaviour1987,Reprint2000, KonarkPublishersPvt.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

Subject Code	SubjectName	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	UNDERSTANDINGINTERNET	Specific Elective	2	-	-		2	25	75	100

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

UNIT	Contents	No. Of.Hours
I	Theemergenceofinternetasamassmedium–theworld of‗worldwide web'.	**6**
II	Featuresofinternetasatechnology.	**6**
III	Internetasasource ofinfotainment–classificationbasedoncontentandstyle.	**6**
IV	Demographicandpsychographicdescriptionsofinternet‗audiences'–effect ofinternetonthevaluesandlife-styles.	**6**
V	Presentissuessuchascybercrimeandfuture possibilities.	**6**
	TOTALHOURS	**30**

CourseOutcomes		Programme Outcomes
CO	Oncompletionofthiscourse,studentswill	
CO1	Knowsthebasicconceptininternet Conceptofmassmediumandworldwideweb	PO1, PO2, PO3,PO4,PO5,PO6
CO2	Knowstheconceptof internetasatechnology.	PO1, PO2, PO3,PO4,PO5,PO6
CO3	Understandtheconceptofinfotainmentandclassificationbasedoncontent andstyle	PO1, PO2,PO3, PO4,PO5,PO6
CO4	CanbeabletoknowaboutDemographicandpsychographicdescriptionof internet	PO1, PO2,PO3, PO4,PO5,PO6
CO5	Understandtheconceptofcybercrimeandfuturepossibilities	PO1, PO2, PO3,PO4,PO5,PO6

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