Vel Tech Multi Tech

Dr.Rangarajan Dr.Sagunthala Engineering College

An Autonomous Institution

Department of Computer Science and Engineering

B.Tech-ArtificialIntelligence andDataScience

CurriculumSyllabus–Regulation2019

SEMESTERI

CourseCode	Nameof theCourse	Category	L	T	P	Credits
191MA101	EngineeringMathematics–I	BS	2	2	0	3
191PH101	EngineeringPhysics	BS	3	0	0	3
191CH101	EngineeringChemistry	BS	3	0	0	3
191HS101	EnglishforEngineeringStudents	HSS	3	0	0	3
191RA111	BasicEngineeringScience	ES	3	0	0	3
191CS111	IntroductiontoProgramminginC	ES	3	0	0	3
191PH10A	**PhysicsLaboratory**	**BS**	**0**	**0**	**2**	**1**
191CH10A	**ChemistryLaboratory**	**BS**	**0**	**0**	**2**	**1**
191CS11A	**ProgramminginCLaboratory**	**ES**	**0**	**0**	**2**	**1**
		Total	**17**	**2**	**6**	**21**

SEMESTERII

CourseCode	Nameof theCourse	Category	L	T	P	Credits
191MA202	Calculus and Differential Equations	BS	2	2	0	3
191HS201	Environmental Science and Engineering	HSS	3	0	0	3
191EC212	Digital System Design	ES	3	0	0	3
191ME211	Engineering Graphics	ES	2	2	0	3
191AI221	Foundations of Data Science	PC	3	0	0	3
191CS221	Problem Solving and Python Programming	PC	3	0	0	3
191ME21A	**Engineering Practice Laboratory**	ES	0	0	4	2
191CS22A	**Problem Solving and Python Programming Laboratory**	PC	0	0	2	1
		Total	**16**	**4**	**6**	**21**

SEMESTERIII

CourseCode	Nameof theCourse	Category	L	T	P	Credits
191MA303	ProbabilityandStatistics	BS	2	2	0	3
191AI321	DataStructures	PC	3	0	0	3
191CS322	ComputerArchitecture	PC	3	0	0	3
191CS323	ObjectOrientedProgramming	PC	3	0	0	3
191CS324	SoftwareEngineering	PC	3	0	0	3
191AI322	IntroductiontoArtificialIntelligence	PC	3	0	0	3
191AI32A	**DataStructuresLaboratory**	PC	0	0	2	1
191CS32B	**ObjectOrientedProgrammingLaboratory**	PC	0	0	2	1
191HS30A	**AdvancedReadingandWriting Skills Laboratory**	HSS	0	0	2	1

	Total	**17**	**2**	**6**	**21**

SEMESTERIV

CourseCode	Nameof theCourse	Category	L	T	P	Credits
191MA403	Discrete Mathematics	BS	2	2	0	3
191CS424	Computer Networks	PC	3	0	0	3
191CS422	Database Management Systems	PC	3	0	0	3
191AI421	Embedded Systems	PC	3	0	0	3
191CS423	Operating Systems	PC	3	0	0	3
191CB422	Software Design and Modeling	PC	3	0	0	3
191CS42A	**Database Management Systems Laboratory**	PC	0	0	2	1
191CS42C	**Networks Laboratory**	PC	0	0	2	1
191CS42B	**Operating Systems Laboratory**	PC	0	0	2	1
191MC46A	**Internship / Training - I**	MC	0	0	0	**
	Total	**17**	**2**	**6**	**21**	

SEMESTER V

CourseCode	Nameof theCourse	Category	L	T	P	Credits
191MA504	Graph Theory and Applications	BS	2	2	0	3
191AI521	Design and Analysis of Algorithms	PC	3	0	0	3
191AI522	Internet Programming	PC	3	0	0	3
	Professional Elective – I	PE	3	0	0	3
	Professional Elective - II	PE	3	0	0	3
	Open Elective – I	OE	3	0	0	3
191HS50A	**Professional Communication**	HSS	0	0	2	1
191AI52A	**Design and Analysis of Algorithms Laboratory**	PC	0	0	2	1
191AI52B	**Internet Programming Laboratory**	PC	0	0	2	1
191MC56A	**Technical Seminar**	MC	0	0	0	**
	Total	**17**	**2**	**6**	**21**	

SEMESTER VI

CourseCode	Nameof theCourse	Category	L	T	P	Credits
191AI621	Big Data Analytics	PC	3	0	0	3
191AI622	Computer Graphics and Multimedia	PC	3	0	0	3
191CB621	Machine Learning Techniques	PC	3	0	0	3
	Professional Elective – III	PE	3	0	0	3
	Open Elective – II	OE	3	0	0	3
191AI62A	Computer Graphics and Multimedia Laboratory	PC	0	0	2	1
191AI62B	Data Analytics Laboratory	PC	0	0	2	1
191AI67A	**Mini Project**	PROJ	0	0	4	2
191MC66A	**Internship / Training – II**	MC	0	0	0	**
	Total	**15**	**0**	**8**	**19**	

SEMESTER VII

CourseCode	Nameof theCourse	Category	L	T	P	Credits
191AI721	Artificial Neural Networks and Deep Learning	PC	3	0	0	3
191CS721	Cloud Computing	PC	3	0	0	3
	Professional Elective – IV	PE	3	0	0	3
	Professional Elective – V	PE	3	0	0	3
	Open Elective – III	OE	3	0	0	3
191AI72A	Artificial Neural Networks and Deep Learning Laboratory	PC	0	0	2	1
191CS72A	Cloud Computing Laboratory	PC	0	0	2	1
191AI77A	**Project Work - Phase I**	PROJ	0	0	2	2
		Total	**15**	**0**	**6**	**19**

SEMESTER VIII

CourseCode	Nameof theCourse	Category	L	T	P	Credits
191AI821	Blockchain Technology	PC	3	0	0	3
	Professional Elective – VI	PE	3	0	0	3
191AI87A	**Project Work - Phase II**	PROJ	0	0	24	12
		Total	**6**	**0**	**24**	**18**

Total Credits: 161

LIST OF PROFESSIONAL ELECTIVES

Year	Semester	Professional Elective	Course Code	Name of the Course	Category	L	T	P	C
III	V	I	191CS539	Internet Of Things	PE	3	0	0	3
III	V		191AI531	Multi Core Architecture and Programming	PE	3	0	0	3
III	V		191AI532	Principles of Programming Languages	PE	3	0	0	3
III	V		191AI533	Soft Computing	PE	3	0	0	3
III	V		191AI534	Software Reliability And Metrics	PE	3	0	0	3
III	V	II	191AI535	Data mining and warehousing	PE	3	0	0	3
III	V		191AI536	Fuzzy logic and Neural networks	PE	3	0	0	3
III	V		191AI537	Network Design and Technologies	PE	3	0	0	3
III	V		191AI538	Security Practices	PE	3	0	0	3
III	V		191CS536	Software Testing	PE	3	0	0	3
III	VI	III	191AI631	Bio- Informatics	PE	3	0	0	3
III	VI		191AI632	Malware Analysis in Data science	PE	3	0	0	3
III	VI		191AI633	Real Time Systems	PE	3	0	0	3
III	VI		191AI634	Sentiment Analysis	PE	3	0	0	3
III	VI		191AI635	Virtual and Augmented Reality	PE	3	0	0	3
IV	VII	IV	191IT737	Pattern Recognition	PE	3	0	0	3
IV	VII		191CS737	Social Network Analysis	PE	3	0	0	3
IV	VII		191AI731	Business Intelligence	PE	3	0	0	3
IV	VII		191AI732	Information Retrieval	PE	3	0	0	3
IV	VII		191AI733	Trust Networks	PE	3	0	0	3
IV	VII	V	191CS732	Digital Image Processing	PE	3	0	0	3
IV	VII		191IT735	Game Programming	PE	3	0	0	3
IV	VII		191AI734	Data Visualization	PE	3	0	0	3
IV	VII		191AI735	Ethics of Engineers	PE	3	0	0	3
IV	VII		191AI736	Software Project Management	PE	3	0	0	3
IV	VIII	VI	191AI831	AI For Clinical Information System	PE	3	0	0	3
IV	VIII		191AI832	Human Computing Interaction	PE	3	0	0	3
IV	VIII		191AI833	Natural Language Processing	PE	3	0	0	3
IV	VIII		191AI834	Robotics	PE	3	0	0	3
IV	VIII		191AI835	Software Orientated Architecture	PE	3	0	0	3

SEMESTER-I

YEAR	I	SEMESTER	I	L	T	P	C
COURSE CODE /COURSETITLE	191MA101 /ENGINEERINGMATHEMATICS–I			2	2	0	3

COURSEOBJECTIVES
✓ Todevelopgreaterknowledgeandunderstandingofmathematicsandtoattaintheskillsnecessaryforsuccessinthestudyofhighermathematics.

SYLLABUS		
UNIT-I	MATRICES	9
Characteristicequation–Eigen valuesand Eigen vectorsofarealmatrix – Propertiesof Eigen valuesCayleyHamiltontheorem-Orthogonalreductionofasymmetricmatrixtodiagonalform– Reductionofquadraticformbyorthogonaltransformation-Applications.		
UNIT-II	GEOMETRICALAPPLICATIONSOFDIFFERENTIALCALCULUS	9
Curvature–CartesianandPolarcoordinates–Centreofcurvature,Circleofcurvature–Evolutesand Envelopes – Applications.		
UNIT-III	FUNCTIONSOFSEVERALVARIABLES	9
Function of two variables – Partial derivatives – Total derivative – Change of Variables – Jacobians-Taylor'sexpansion – Maxima and Minima – Constrained Maxima andMinimabyLagrangian Multiplier method-Applications.		
UNIT-IV	ORDINARYDIFFERENTIALEQUATIONS	9
Linear differential equations of second and higher order with constant coefficients – Method of variation ofparameters – Equations reducible to linear equations with constantcoefficients: Cauchy's homogeneous linearequationandLegendre'slinearequation–Simultaneous linearequationswithconstantcoefficients -Applications.		

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Analyze the characteristics equation of a linear system with Eigen values and vectors for practical application.
CO2	Determine the bending of family of curves using differential calculus which deals in various disciplines.
CO3	Apply partial derivatives in various engineering problems.
CO4	Identify and solve the real time problems using higher order differential equations.

TEXTBOOKS

1. Kreyszig.E,"AdvancedEngineeringMathematics",JohnWiley&Sons.Singapore,10th edition,2012
2. Grewal.B.S,HigherEngineeringMathematics,KhannaPublications,42ndEdition,2012

REFERENCES

1. Veerarajan.T,"EngineeringMathematics",TataMcGrawHillPublishingCo,NewDelhi,5th edition,2006.
2. Kandasamy.Pet.al."EngineeringMathematics",Vol.I(4threviseded edition),S.Chand&Co,NewDelhi,2000.

CO – PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	-	-	-	-	-	-	1
CO2	3	3	2	2	1	-	-	-	-	-	-	1
CO3	3	3	2	2	1	-	-	-	-	-	-	1
CO4	3	3	2	2	1	-	-	-		-	-	1
CO	**3**	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

YEAR	I	SEMESTER	I	L	T	P	C
COURSE CODE /COURSETITLE	191PH101 /ENGINEERINGPHYSICS			3	0	0	3

COURSEOBJECTIVES
✓ The course aims to equipengineering undergraduateswith principles of Physicsin a broader sense with aviewtolayfoundationforthevariousengineeringcourses.

SYLLABUS		
UNIT-I	PROPERTIES OFSOLIDS	9
Elasticity- Hooke's law – stress -strain diagram – Poisson's ratio –Factors affecting elasticity –Bending moment – Depression of a cantilever –Young's modulus by uniform bending- Young's modulus by non-uniform bending(Theory and Experiment) - Torsional stress and twisting couple- Torsional Pendulum(Theory and Experiment) I-shapedgirders.		
UNIT-II	PRINCIPLES OFLASERS	9
Properties of laser radiation and their significance-wavelength, power, monochromaticity, coherence. Types oflasers working media and their radiation characteristics-Power, wavelength and operational modes of He-Ne,Carbon-dioxide.PhysicalprinciplesofLaserbeamdeliverysystems.Applications-IndustryandMedical. Selectionoflasersforvariousapplications.		
UNIT-III	OPTICALFIBRESYSTEMS	9
Optical Fibers- Propagation mechanism -Critical Angle- Snell's Law-Total Internal Reflection- Acceptance cone-Numerical aperture- Types of fibers- Attenuation-Active and passive fiber sensors(Temperature andDisplacement)-Applications(IndustryandMedical) - communicationinoptical fiber- Endoscope.		
UNIT-IV	WAVENATUREOFPARTICLES	9
Introduction to Quantum mechanics, Black body radiation- Planck's Hypothesis-Compton Effect (Theory andExperiment) -Wave nature of Particles, Time-dependent and time-independent Schrodinger equation forwavefunction,Schrodingerequationforonedimensionalproblem - particleinabox-SEMandTEM.		
UNIT-V	SOLIDSTATE PHYSICS	9

Crystalline and non-crystalline materials-Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – Expressionforinterplanarspacing-Bragg'slaw-DiffractionofX-raysbycrystalplanes-Co-ordinationnumber.Atomic packing factors (SC, FCC, BCC and HCP structures) – Diamond and graphite structures (qualitativetreatment)-Crystalgrowthtechniques(BridgmanandCzochralski).

COURSEOUTCOMES Oncompletionofthecourse,students willbeableto	
CO1	Demonstrate the proficiency on the properties of matter and its applications.
CO2	Describe the working principles of Laser and its developments in industrial and medical applications.
CO3	Explain the propagation of waves in optical fibers and their applications.
CO4	Apply the theory of wave nature of particles in various microscopic applications.
CO5	Analyze the structure of materials and its crystal growth techniques.

TEXTBOOKS

1. 'EngineeringPhysics',R.K.GaurandS.L.Gupta,DhanpatRaiPublications (P)Ltd.,8thEdition. NewDelhi(2001).
2. IntroductiontoSolidStatePhysics,7thEdition,Charles Kittel,Wiley,Delhi2007.
3. Halliday,D.,Resnick,R.&Walker,J.—PrinciplesofPhysics‖. Wiley,2015.

REFERENCES

1. Laser Fundamentals,WilliamT.Silfvast,2ndEdition, CambridgeUniversitypress, NewYork,2004.
2. FundamentalsofPhysics,6thEdition, D. Halliday, R.ResnickandJ.Walker, JohnWileyandSons,NewYork2001.
3. E.Hecht,Optics,PearsonEducation,2008

CO – PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	-	2	2	2	2	-	-	2
CO2	3	3	2	2	-	2	2	2	2	-	-	2
CO3	3	3	2	2	-	2	2	2	2	-	-	2
CO4	3	3	2	2	-	2	2	2	2	-	-	2

CO5	3	3	2	2	-	2	2	2	2	-	-	2
CO	**3**	**3**	**2**	**2**	**-**	**2**	**2**	**2**	**2**	**-**	**-**	**2**

YEAR	I	SEMESTER	I	L	T	P	C
COURSE CODE /COURSETITLE	191CH101/ENGINEERINGCHEMISTRY			3	0	0	3

COURSEOBJECTIVES

- ✓To acquaint the students with the development of microscopic chemistry in terms of atomic, molecular and intermolecular forces and acquires the knowledge of water treatment. The students will be able to analyze the properties and applications of polymer and advanced materials.

SYLLABUS

UNIT-I	CHEMICALBONDING	9

Types of chemical bonds - bond polarity- dipole moment – partial ionic character - consequences. WeakInteractions – Hydrogen bonding, van der Waals forces - influence on properties of matter. Metallic bond – freeelectrontheory,MOtreatment- bandtheory-metals,semiconductorsandinsulators.Nonstoichiometricsemiconductors,chalgogensemiconductors.Defectstructuresofcrystals–SchottkyandFrenkeldefects.

UNIT-II	WATERCHEMISTRY	9

Hardness - determination (EDTA method). Water softening - zeolite and demineralization processes. Desalinationby electro-dialysis and reverse osmosis. Water analysis by fluoride ion, Water quality parameters, Instrumentalmethods forwateranalysis- AAS,flameemissionspectroscopy,ICP-MSandphoto-colorimetry

UNIT-III	ELECTROCHEMISTRY	9

Electrode potential – standard and reference electrodes, Nernst equation, emf series – applications. Galvanic andconcentrationcells.Applicationsofpotentialmeasurements– glasselectrode-pHmeasurement,acid-basetitration,redoxtitration.Conductance measurement–applications–conductometrictitrations.

UNIT-IV	POLYMERS	9

Classification, degree of polymerization, molecular weight – Mn and Mw. Polymerization reactions. Glasstransition temperature – factors affecting Tg - determination by DSC. Polymer processing - compounding, outlineof moulding techniques compression, injection, extrusion and blow moulding. Charge transport in conjugatedpolymers- dopedconjugatedpolymers- glucosebiosensor.PolymersforLEDandLCDdisplays.

UNIT-V	ADVANCEDMATERIALS	9

Carbon nano-tubes and carbon fibers, graphene and polymer nano-composites-properties and applications -morphological studies by SEM and TEM. Solid oxide materials and polymer electrolytes -energy storingapplications. Polymer blends and alloys, photo and electroluminescence materials, insulating materials,photopolymersandphotoresistsforelectronics, polymerphoto-voltaics.

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Analyzemicroscopicchemistryintermsofatomic,molecularorbitalandIntermolecularForces.
CO2	Investigatethewatertreatmentandsofteningmethods.
CO3	Appraisethetypes andmechanismofelectrochemicalreactioninbatteriesandfuelcells.
CO4	Explainthebasicprinciple,typesandmechanismofpolymerizationprocess andtechniques.
CO5	Assess theadvancedmaterialsproperties,characterizationandapplicationofenergystorage.

TEXTBOOKS

1. MaryJaneShultz,- "EngineeringChemistry",CengageLearning,USA,2009.
2. PalannaO. G.,-"EngineeringChemistry",Tata McGraw Hill Education Pvt.Ltd.,NewDelhi,2009.

REFERENCES

1. GesserH.D.,-"AppliedChemistry-ATextbookforEngineersandTechnologies",Springer,NewYork, 2008.
2. GowarikarV.R.,ViswanathanN.V.andJayadevSreedhar,- "PolymerScience",NewAgeInternational(P)Ltd.,NewDelhi,2011.
3. VijayamohananK.PillaiandMeeraParthasarathy.–"FunctionalMaterials-AChemist'sPerspective"UniversitiesPress,India, 2012.
4. ShashiChawla,-"ATextbookofEngineeringChemistry",DhanpatRai&Co,NewDelhi,2005

CO – PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	-	2	2	-	-	-	-	2
CO2	3	3	2	2	-	2	2	-	-	-	-	2
CO3	3	3	2	2	-	2	2	-	-	-	-	2
CO4	3	3	2	2	-	2	2	-	-	-	-	2
CO5	3	3	2	2	-	2	2	-	-	-	-	2
CO	**3**	**3**	**2**	**2**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**2**

YEAR	I	SEMESTER	I	L	T	P	C
COURSE CODE /COURSETITLE	191HS101 / ENGLISH FOR ENGINEERINGSTUDENTS			3	0	0	3

COURSEOBJECTIVES
✓ EquipstudentswiththeEnglishlanguageskillsrequiredforthesuccessfulundertakingofacademicstudies. ✓ Improvegeneralandacademiclisteningskills. ✓ Provideguidanceandpracticeinbasicgeranialandclassroomconversationandtoengageinspecificacademicspeakingactivities. ✓ Strengthenthereadingandwritingskills ofstudents ofengineering.

SYLLABUS		
UNIT-I	VOCABULARYBUILDING	9
Word formation - Prefixes and Suffixes – Root words from foreign languages – Synonyms – Antonyms – CompoundNouns–StandardAbbreviations.		
UNIT-II	GRAMMATICALCOMPETENCY	9
Noun,Verb,Adjective–Subject-VerbAgreement–Articles–Prepositions–Purposeexpressions – ModelVerbs.		
UNIT-III	BASICWRITINGSKILLS	9
Sentence structure – Phrases – Clauses – Coherence – Cohesion (using linking words) – Paragraph Writing(DescriptiveandNarrative).		
UNIT-IV	READINGSKILLS	9
ReadingStrategies– SkimmingandScanning– ReadingComprehensionexerciseswith multiplechoiceandopenendedquestions–TransformingInformationintheformof charts–NoteMaking.		
UNIT-V	ORALCOMMUNICATION	9
(This unitinvolves interactivepracticesessionsinLanguageLab)ListingComprehension. Pronunciation, SyllableandStress,RhythmandIntonation. Generalconversationsanddialogues,commonineverydaysituationssoShort Speech.		

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Infer meanings of unfamiliar words from context.
CO2	Enable to achieve linguistic competence andbe able to use grammar as a tool or resource in the Comprehension and creation of oral and written discourse efficiently according to the situation.
CO3	Write cohesively, coherently and flawlessly with a wide range of vocabulary and organizing their ideas Logically on a topic.
CO4	Activate and reinforce the habit of reading and writing effectively in their discipline.
CO5	Collaborate with multicultural environment.

TEXTBOOKS

1. DepartmentofEnglish,Anna University,Mindscapes:EnglishforTechnologistsandEngineers,OrientBlackswan,Chennai–2012.
2. Dhanavel, S.P.EnglishandCommunicationSkillsforStudentsofScienceandEngineering,OrientBlackswan,Chennai–2011.
3. CommunicationSkills.SanjayKumarandPushpa Lata.Oxford UniversityPress.2011

REFERENCES

1. PracticalEnglishUsage.MichaelSwan.OUP.1995.
2. RemedialEnglishGrammar.F.T. Wood.Macmillan.2007.
3. StudyWriting.LizHamp-LyonsandBenHeasly.CambridgeUniversityPress.2006.
4. ExercisesinSpokenEnglish.Parts.I-III.CIEFL,Hyderabad.OxfordUniversityPress.
5. PracticalEnglishUsage.MichaelSwan.OUP.1995

CO – PO MAPPING												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	2	-	2	2	-	-	-	-	2
CO2	3	3	2	2	-	2	2	-	-	-	-	2
CO3	3	3	2	2	-	2	2	-	-	-	-	2
CO4	3	3	2	2	-	2	2	-	-	-	-	2
CO5	3	3	2	2	-	2	2	-	-	-	-	2
CO	**3**	**3**	**2**	**2**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**2**

YEAR	I	SEMESTER	I	L	T	P	C
COURSE CODE /COURSETITLE	191RA111 /BASICENGINEERINGSCIENCE			3	0	0	3

COURSEOBJECTIVES
✓ TogainknowledgeinfundamentalconceptsofElectricalandElectronicsEngineering ✓ Togainknowledge infundamentalconceptsCivilandMechanicalEngineering ✓ TounderstandthearchitecturelevelconceptsofComputerScienceEngineering

SYLLABUS		
UNIT-I	INTRODUCTIONTOELECTRICALCONCEPTS	9
Basic principles involved in Power Generation, Transmission and Distribution - Wiring Systems - Classification oflightsources- Tari- ElectricalSafetyPractices- Applications-EmergingTrends.		
UNIT-II	INTRODUCTIONTOELECTRONICCONCEPTS	9
BasicElectronicDevices-NumberSystems-ElectronicInstruments-IntroductiontoAnalogandDigitalElectronics-Applications-EmergingTrends.		
UNIT-III	OVERVIEWOFCOMPUTERARCHITECTURE	9
Introduction- Structure and Function - Data Processing - Data Storage - Data Movement -Structural Components:Memory and Processing Units. Bus Interconnections - Multiple Bus Hierarchies - Elements of Bus Design -DesktopandServerSystems.		
UNIT-IV	SCOPEOFCIVILENGINEERING	9
Overview of Civil Engineering, Civil Engineering contributions to the welfare of Society, Specialized subdisciplines in Civil EngineeringStructural, Construction, Geotechnical, Environmental, Transportation andWaterResourcesEngineering.		
UNIT-V	INTRODUCTIONTOMECHANICALENGINEERING	9
ManufacturingMethods-DesignConsiderations-Limits,FitsandStandardization–ZerothlawofThermodynamics-ConceptofTemperatureandHeat-ClassificationofICEngines-TypesofPowerPlants.		

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Describe thebasicElectricalCircuits.
CO2	Explain thebasicsofElectronicCircuits.
CO3	DemonstratethebasicstructureofComputerArchitecture.
CO4	AnalyzethebasicsofCivilEngineering.
CO5	DefinethebasicsofMechanicalEngineering.

TEXTBOOKS

1. Thereja .B.L.,"FundamentalsofElectricalEngineeringandElectronics",S.Chand& Co.Ltd.,2008
2. WilliamStallings,"ComputerOrganizationandArchitecture",Pearson, TenthEdition, 2016.
3. ShanmugamGandPalanichamyMS, "BasicCivil and MechanicalEngineering",TataMcGrawHillPublishingCo.,NewDelhi,1996.

REFERENCES

1. LeonardSBobrow,"FoundationsofElectricalEngineering", OxfordUniversityPress,2013
2. Ram AmruthamS., "BasicCivilEngineering",DhanpatRaiPublishingCo.(P)Ltd.1999.
3. N.N.Bhargava, D.C.Kulshreshtha ,S.C.Gupta,"BasicElectronicsandLinear Circuits",NITTTR,Chandigarh2017.

CO – PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	-	-	1	-	-	-	1	1
CO2	3	2	1	1	-	1	1	-	-	1	1	1
CO3	3	3	2	2	1	1	1	-	-	1	1	1
CO4	2	1	1	1	-	-	1	-	-	-	1	1
CO5	2	1	1	1	-	-	1	-	-	-	1	1
CO	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**-**	**-**	**1**	**1**	**1**

YEAR	I	SEMESTER	I	L	T	P	C
COURSE CODE /COURSETITLE	191CS111/INTRODUCTIONTOPROGRAMMINGINC			3	0	0	3

COURSEOBJECTIVES
✓ Learntheorganizationofadigitalcomputer. ✓ Beexposedtothenumbersystems. ✓ Learntothinklogicallyandwritepseudocodeordrawflowchartsforproblems. ✓ BeexposedtothesyntaxofC. ✓ Befamiliarwithprogrammingin C. ✓ Learntousearrays,strings,functions,pointers,structuresandunionsinC.

SYLLABUS		
UNIT-I	INTRODUCTION	9
Generation and Classification of Computers- Basic Organization of a Computer –Number System – Binary – Decimal – Conversion – Problems. Need for logical analysis and thinking – Algorithm – Pseudo code – FlowChart.		
UNIT-II	CPROGRAMMINGBASICS	9
Problem formulation – Problem Solving - Introduction to C-programming –fundamentals – structure of a C-program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators inC – Managing Input and Output operations – Decision Making and Branching – Looping statements – solvingsimplescientific andstatisticalproblems.		
UNIT-III	ARRAYSANDSTRINGS	9
Arrays – Initialization – Declaration – One dimensional and two-dimensional arrays. String - String operations – StringArrays.Simpleprograms-sorting- searching–matrixoperations		
UNIT-IV	FUNCTIONSANDPOINTERS	9
Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion – Pointers-Definition–Initialization–Pointer'sarithmetic – Pointersandarrays-ExampleProblems.		
UNIT-V	STRUCTURES ANDUNIONS	9
Introduction–needforstructuredatatype– structuredefinition– Structuredeclaration–Structurewithinastructure-Union-Programs usingstructures andUnions–Storageclasses,Pre-processordirectives.		

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Describe the basic concepts of C programming for problem-solving.
CO2	Write simple applications using basic programming constructs.
CO3	Develop applications using arrays and strings to solve different problems.
CO4	Apply the concepts of function modules and memory allocation using Pointers.
CO5	Implement the concept of structures for developing applications.

TEXTBOOKS

1. Anita Goel and Ajay Mittal, "Computer Fundamental sand Programming in C", Dorling Kindersley (India)Pvt.Ltd., Pearson Education in SouthAsia,2011.
2. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", First Edition, OxfordUniversityPress,2009.
3. Yashavant P.Kanetkar, "Let Us C", BPB Publications,2011.

REFERENCES

1. Byron S Gottfried, "Programming with C", Schaum's Outlines, Second Edition, Tata McGraw-Hill, 2006.
2. Dromey R.G., "How to Solve it by Computer", Pearson Education, Fourth Reprint, 2007.
3. Kernighan,B, Wand Ritchie, D.M, "The C Programming language", Second Edition, Pearson Education,2006.

CO – PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	-	-	-	-	-	-	-	-	1
CO2	2	2	1	-	-	-	-	-	-	-	-	1
CO3	3	2	1	-	-	-	-	-	-	-	-	1
CO4	2	2	1	-	-	-	-	-	-	-	-	1
CO5	2	2	1	-	-	-	-	1	-	-	-	1
CO	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**1**

YEAR	I	SEMESTER	I	L	T	P	C
COURSE CODE /COURSETITLE	191PH10A/ PHYSICSLABORATORY			0	0	2	1

COURSEOBJECTIVES

- ✓ Students will be able to demonstrate an understanding of the scientific method, so that they may use thetrainingbeneficialintheirhigherpursuits.

SYLLABUS

LIST OFEXPERIMENTS

1. DeterminationofRigiditymodulus–Torsionpendulum
2. DeterminationofYoung's modulusbynon-uniformbendingmethod
3. Determination ofPlanck'sConstantandworkfunctionofmaterialsusingphotoelectriceffectexperiment
4. Determinationofwavelength,andparticlesizeusingLaser
5. Determinationofacceptanceangleinanopticalfiber

Demonstration:

1. Determinationofwavelengthofmercuryspectrum–spectrometergrating
2. DemonstrationofCrystalGrowthTechnique
3. Determinationoffiber thickness–Air Wedgemethod.

COURSEOUTCOMES

Oncompletionofthecourse,students willbeableto

CO1	Apply the principles of properties of matter in determining the various elastic properties.
CO2	Attains the practical knowledge, to apply principles of optics for various engineering applications.
CO3	Demonstrate the technical knowledge on Quantum Mechanical concepts.

REFERENCES

- ✓ WilsonJ.D.andHernandezC.A.,-"PhysicsLaboratoryExperiments",HoughtonMifflin Company,NewYork2005.

CO – PO MAPPING												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	2	-	2	2	2	2	-	-	2
CO2	3	3	2	2	-	2	2	2	2	-	-	2
CO3	3	3	2	2	-	2	2	2	2	-	-	2
CO	**3**	**3**	**2**	**2**	**-**	**2**	**2**	**2**	**2**	**-**	**-**	**2**

YEAR	I	SEMESTER	I	L	T	P	C
COURSE CODE /COURSETITLE	191CH10A/CHEMISTRYLABORATORY			0	0	2	1

COURSEOBJECTIVES

- ✓ To furnish the conceptual understanding of the basic principles involved in chemical analysis.
- ✓ To attain the analytical knowledge of students by conducting various experiments.

SYLLABUS

LIST OFEXPERIMENTS

1. Determinationoftotal,permanent,temporary,calciumandmagnesiumhardnessofwaterbyEDTA method.
2. Conductometrictitration-determinationofstrengthofanacid
3. Estimationofironbypotentiometry.
4. Determinationofmolecular weightofpolymerbyviscosityaveragemethod
5. Determinationofdissolvedoxygeninawatersamplebywinkler's method
6. DeterminationofNa/KinwatersamplebyFlamephotometry(Demonstration)
7. EstimationofCopperinore
8. Estimationof nickelinsteel
9. Determinationoftotalalkalinityandacidityofawatersample
10. Determinationofrateofcorrosionbyweight lossmethod

COURSEOUTCOMES

Oncompletionofthecourse,students willbeableto

CO1	Acquire knowledge on quantitative chemical analysis by instrumentation and volumetric method.
CO2	Analyze the water sample for hardness, chloride, sodium/ potassium content, dissolved oxygen etc.
CO3	Solve analytical problems in spectrometer and flame photometer for the identification and quantification.

REFERENCES

- ✓ Vogel'sTextbookofquantitativechemicalAnalysis(8^{th}edition,2014).

CO – PO MAPPING												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	2	-	2	2	2	2	-	-	2
CO2	3	3	2	2	-	2	2	2	2	-	-	2
CO3	3	3	2	2	-	2	2	2	2	-	-	2
CO	**3**	**3**	**2**	**2**	**-**	**2**	**2**	**2**	**2**	**-**	**-**	**2**

YEAR	I	SEMESTER	I	L	T	P	C
COURSE CODE /COURSETITLE	191CS11A/PROGRAMMING INCLABORATORY			0	0	2	1

COURSEOBJECTIVES

- ✓ Todevelop programsinCusingbasicconstructs.
- ✓ TodevelopapplicationsinCusingstrings,pointers,functions, structures.
- ✓ TodevelopapplicationsinC usingfileprocessing.

SYLLABUS

LIST OFEXPERIMENTS

1. Programusing I/Ostatementsandexpressions.
2. Programusingdecision-makingconstructs.
3. Writeaprogramtofind whetherthegivenyearisleap year.
4. Designa calculatortoperformtheoperations,namely,addition,subtraction,multiplication,divisionandsquare of anumber.
5. Checkwhether agivennumber isArmstrongnumber or not?
6. Populateanarraywithheightof personsandfindhowmanypersonsareabovetheaverageheight.
7. Populateatwo - dimensionalarraywithheightandweightofpersons andcomputetheBodyMassIndexofthe individuals.
8. Givenastring—a$bcd/fg‖ finditsreversewithoutchangingthepositionofspecialcharacters.
9. Convertthegivendecimalnumberintobinary,octalandhexadecimalnumbersusinguserdefinedfunctio ns.
10. Fromagivenparagraphperformthefollowingusingbuilt-infunctions:

    a. Findthetotalnumberofwords.
    b. Capitalizethefirstwordofeachsentence.
    c. Replaceagivenwordwithanotherword.

11. Solvetowers ofHanoiusing recursion.
12. Sort thelistofnumbers usingpass byreference.
13. Generatesalaryslipofemployees usingstructures andpointers.
14. Computeinternal marksofstudentsforfivedifferentsubjectsusingstructuresandfunctions
15. Insert,update,deleteandappendtelephonedetailsofanindividualoracompanyintoatelephonedirectory usingrandomaccessfile.
16. Count thenumberofaccountholderswhosebalanceis less thantheminimumbalanceusingsequentialaccessfile.

Mini Projects:

17. Bank Management System.
18. Hotel Management System.
19. Library Management System.

COURSEOUTCOMES Oncompletionofthecourse,students willbeableto	
CO1	Write C programs for simple applications making use of basic constructs, arrays and strings.
CO2	Develop C programs involving functions, recursion, pointers, and structures.
CO3	Design applications using sequential and random-access file processing.

Requirementsforabatchof30students(3studentsperbatch
)

S.No	Description of Equipment	Quantity required	Quantity available (A)	Deficiency (R-A)
1	Desktop PCs with Linux Operating System	30	30	Nil
2	GNU compiler	30	30	Nil

CO – PO MAPPING												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	2	2	2	-	-	1	-	-	-	2
CO2	3	2	2	2	2	-	-	1	-	-	-	2
CO3	3	2	2	2	2	-	-	1	-	-	-	2
CO	**3**	**2**	**2**	**2**	**2**	**-**	**-**	**1**	**-**	**-**	**-**	**2**

SEMESTER–II

YEAR	I	SEMESTER	II	L	T	P	C
COURSE CODE /COURSETITLE	191MA202/ CALCULUS AND DIFFERENTIALEQUATION			2	2	0	3

COURSEOBJECTIVES

- ✓ Toextendstudent'slogicalandmathematicalmaturityandabilitytodealwithabstraction.
- ✓ The abilitytoapplythebasicconceptsofdifferentialcalculusandtheirapplicationsinthe fieldof InformationTechnology.

SYLLABUS		
UNIT-I	**LIMITSAND CONTINUITY**	**12**

Introductiontolimit–properties –limitbydirectsubstitution–algebraicmanipulations–squeezetheorem–continuity at a point – continuity over a interval – removal of discontinuity – Intermediate value theorem(statementonly)–problems.

UNIT-II	**BASICDIFFERENTIATIONANDITS RULES**	**12**

AveragerateofChange– Derivative-basicdefinitions- Methodoffirstprinciple– problems-Methodofdifferentiation–sum–difference–product–quotientrule–problems.

UNIT-III	**ADVANCEDDIFFERENTIATION**	**12**

Chainrule–Implicitdifferentiation– Inversefunctiondifferentiation–Logarithmicdifferentiation–Higherderivatives–Lebnitztheorem(statementonly)-problems.

UNIT-IV	**APPLICATIONOFDERIVATIVES**	**12**

Derivative: Slope – Tangent and Normal – problems - Related rates – Introduction – problems – Approximation – L'HospitalRule–problems.

UNIT-V	**ANALYZINGFUNCTIONSUSING DIFFERENTIATION**	**12**

Mean value theorem – Extreme value theorem – Increasing and decreasing - Maxima and Minima – first andsecondderivativetest–convexityandinflexion.

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Usealgebraicmanipulationandtheorem,properties,limitsandcontinuityinaninterval.
CO2	Applyderivativeprinciplesandrulestodifferent kindsofproblem.
CO3	Analyzethedifferenttypesofdifferentiationandmovingforwardforadvanceddifferentiation.
CO4	Analyzethederivativefunctionsfordifferentapplications.
CO5	Evaluatethefunctionsusingdifferentiation.

TEXTBOOKS

1. R.K.GhoshandK. C. Maity,"IntroductiontoAnalysis,DifferentialCalculusPart-I", NCBA.
2. 2.B.C.DasandB.N.Mukherjee,"DifferentialCalculus",Revised52ndEdition,U.N.Dhur&SonsPrivateLtd.,Kolkata.

REFERENCES

- ✓ JosephEdwards,"DifferentialCalculusforBeginners',MacmillanandCo.Ltd.,Newyork,1896

CO – PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	-	1	-	-	-	-	1
CO2	3	3	2	2	1	-	1	-	-	-	-	1
CO3	3	3	2	2	1	-	1	-	-	-	-	1
CO4	3	3	2	2	1	-	1	-	-	-	-	1
CO5	3	3	2	2	1	-	1	-	-	-	-	1
CO	**3**	**3**	**2**	**2**	**1**	**-**	**1**	**-**	**-**	**-**	**-**	**1**

YEAR	I	SEMESTER	II	L	T	P	C
COURSE CODE /COURSETITLE	191EC212/DIGITALSYSTEMDESIGN			3	0	0	3

COURSEOBJECTIVES

- ✓ TopresenttheDigitalfundamentals,Booleanalgebraanditsapplications indigitalsystems.
- ✓ Tofamiliarizewiththedesignofvarious combinational digitalcircuits usinglogicgates.
- ✓ Tointroducetheanalysis anddesignprocedures forsynchronousandasynchronous sequentialcircuits.
- ✓ Toexplainthevarioussemiconductormemoriesandrelatedtechnology.

SYLLABUS

UNIT-I	BOOLEANALGEBRA	9

Boolean Algebra - Theorems and Properties of Boolean Algebra -Digital Logic Gates – Universal gateImplementations-BooleanFunctions-CanonicalandStandardForms-SimplificationofBooleanFunctionsusingKarnaughMap,Quine-McCluskey(QM)Technique.

UNIT-II	COMBINATIONALLOGIC	9

CombinationalCircuits–AnalysisandDesignProcedures-BinaryAdder-Subtractor-DecimalAdder-BinaryMultiplier-MagnitudeComparator-Decoders–Encoders–Multiplexers–Demultiplexer-IntroductiontoHDL –HDLModelsofCombinationalcircuits.

UNIT-III	SYNCHRONOUSSEQUENTIALLOGIC	9

SequentialCircuits–Latches, Flip-Flops-AnalysisofClockedSequentialCircuits-StateReductionandAssignment-DesignProcedure- Registers andCounters-HDL ModelsofSequentialCircuits

UNIT-IV	ASYNCHRONOUSSEQUENTIALLOGIC	9

AnalysisofAsynchronousSequentialCircuits-DesignofAsynchronousSequentialCircuitsReductionofStateandFlowTables–Hazards–Designof HazardFreeSwitchingcircuits.

UNIT-V	MEMORYANDPROGRAMMABLELOGICDEVICES	9

Memory classification, STATIC RAM, DYNAMIC RAM, EPROM, EAPROM, EEPROM, Organization ofROM,ProgrammableLogicArray(PLA)andProgrammableArrayLogic(PLA)–ImplementationofPLDs.

COURSEOUTCOMES Oncompletionofthecourse,students willbeableto	
CO1	Apply the theorems and postulates of Boolean algebra, the techniques of Karnaugh Maps and Quine - Mc Cluskey tabulation techniques for simplification of logic functions.
CO2	Design combinational logic circuits for various applications and implement them using logic gates or other devices like multiplexers, decoders and simulate them using Hardware Description Language (HDL).
CO3	Design synchronous sequential logic circuits like counters and shift registers and implement them using different flip flops.
CO4	Analyze the given Asynchronous sequential logic circuit to determine its function.
CO5	Review the various memory and programmable logic devices.

TEXTBOOKS

- ✓ M.MorrisMano&MichaelD.Ciletti, DigitalDesign,Firstimpression, Pearson,2012

REFERENCES

1. CharlesH. RothJr,LarryL.Kinney, FundamentalsofLogicDesign, SixthEdition, CENGAGELearning,2013.
2. JohnF.Wakerly,DigitalDesignPrinciplesandPractices,FifthEdition,PearsonEducation,2017.
3. DonaldD.Givone, DigitalPrinciplesandDesign‖, TataMcGrawHill, 2003.

CO – PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	-	-	-	-	-	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	-
CO3	3	2	2	2	-	-	-	-	-	-	-	-
CO4	3	2	2	2	-	-	-	-	-	-	-	-
CO5	3	2	2	2	-	-	-	-	-	-	-	-
CO	**3**	**2**	**2**	**2**	**-**	-	-	-	-	-	-	-

YEAR	I	SEMESTER	II	L	T	P	C
COURSE CODE /COURSETITLE	191HS201/ENVIRONMENTALSCIENCEANDENGINEERING			3	0	0	3

COURSEOBJECTIVES

- ✓ This course provides the basic knowledge of structure and function of ecosystem and better understanding of natural resources, biodiversity and their conservation practices.
- ✓ It describes the need to lead more sustainable lifestyles, to use resources more equitably.
- ✓ It helps to create a concern for our environment that will trigger pro-environmental action, including activities, we can do in our daily life to protect it.
- ✓ Furthermore, it deals the social issues and ethics to develop quality engineer in our country.

SYLLABUS

UNIT-I	ENVIRONMENT-ANOVERVIEW	9

Ecosystem-concept-structure-function-types. Energy flow in ecosystem. Biodiversity and its conservation-valuesofbiodiversity-threatstobiodiversityconservationofbiodiversity.Naturalresources-types,uses.

UNIT-II	ENVIRONMENTALIMPACTOFENERGYSOURCES	9

Sourcesofprimary energy-presentand future consumption ofenergy-environmental impactsof energydevelopment-oil, naturalgas,coal, hydro-electric, nuclearpower,windmillandsolarpanels-Urbanproblemsrelatedtoenergy-casestudies.

UNIT-III	CLIMATICCHANGEANDSOLIDWASTEMANAGEMENT	9

Environmental pollution- air, water, soil, marine and noise pollution-greenhouse gases- causes, effects - globalwarming, ozone layer depletion, acid rain-sources and effects. Pollution control strategies- preventive measures-green technologies-green building concepts- standards and regulations- role of individuals. Sustainabledevelopment.Hazardouswastes-e-waste-source-effect,management.Nuclearwaste-sources,effects,management, Recyclingofwaste, Future challenges.

UNIT-IV	HUMANPOPULATIONANDTHEENVIRONMENT	9

Population growth, variation among nations – population explosion – familywelfare programme – environmentand human health – human rights – value education – HIV / AIDS – women and child welfare – role ofinformationtechnologyinenvironmentandhumanhealth–Casestudies.

UNIT-V	ENVIRONMENTALLAWSANDETHICS	9

LegalprovisioninIndia-environmentalacts-air,water,forest,soilandwildlife.Environmentalethics-theoriesandcodes-resourceconsumptionpatterns,equity-disparity,urban-ruralequityissues,needforgenderequity,preserving resource for future generation, right of animals, ethical basis of environment education and awareness,ethical problem solving- changing attitude, conservation ethics and traditional value systems of India. Effect ofsocialmediaontheadolescent.

COURSEOUTCOMES Oncompletionofthecourse,studentswillbeableto	
CO1	Interpret the concept of ecosystem, biodiversity and its conservation.
CO2	Demonstrate the environmental impacts of energy development.
CO3	Categorize the various environmental pollutions and select suitable preventive measures.
CO4	Perceive the environmental effects of human population and the implementation of welfare programs.
CO5	Recall the environmental ethics and legal provisions.

TEXTBOOKS

1. ErachBharucha,"TextbookforEnvironmentalsciences forUndergraduatecourses",UGC,2004
2. Kaushik,A&Kaushik,CP,EnvironmentalScienceandengineering",3rdEdition,NewAgeInternational (P) Limited,NewDelhi,2009.
3. Henry,JG&Heinke,GW,"EnvironmentalScienceandEngineering",2ndEdition,PHILearningPrivatelimited,NewDelhi,2011.

REFERENCES

1. Masters,GM&Ela,WP,"IntroductiontoEnvironmentalEngineeringandScience",3rdEdition,PHILearningPrivatelimited,NewDelhi,2009.
2. Encyclopaediaofenvironmentalethicsandphilosophy.Availableatwww.gmu.ac.ir/download/booklibrary/e-library/Encyclopaedia of Environmental Ethics andphilosophy.pdf

CO – PO MAPPING												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	2	-	2	3	3	-	-	-	2
CO2	3	3	2	2	-	2	3	-	-	-	-	2
CO3	3	3	2	2	-	2	3	-	-	-	-	2
CO4	3	3	2	2	-	2	3	-	-	-	-	2
CO5	3	3	2	2	-	2	3	3	-	-	-	2
CO	**3**	**3**	**2**	**3**	**-**	**2**	**3**	**3**	**-**	**-**	**-**	**2**

SEMESTER- II

YEAR	I	SEMESTER	II	L	T	P	C
COURSE CODE /COURSETITLE	191CS221 / PROBLEM SOLVING ANDPYTHONPROGRAMMING			3	0	0	3

COURSEOBJECTIVES

- ✓ Toknowthebasicsof algorithmicproblemsolving.
- ✓ Toreadandwritesimple Pythonprograms.
- ✓ Todevelop Pythonprogramswithconditionalsandloops.
- ✓ TodefinePythonfunctionsandcallthem.
- ✓ TousePythondatastructures–lists,tuples,dictionaries.
- ✓ Todoinput/output withfiles inPython.

SYLLABUS

UNIT-I	ALGORITHMICPROBLEMSOLVING	9

Algorithms, Building blocks of algorithms(statements, state, control flow, functions), Notation(pseudocode, flow chart, programming language), algorithmic problem solving,simple strategies for developingalgorithms(iteration,recursion)Illustrativeproblems:Findminimuminalist,insert acardinalist ofsortedcards,Guessanintegernumberina range,Towersof Hanoi.

UNIT-II	DATA,EXPRESSIONS,STATEMENTS	9

Python interpreter and interactive mode; values and types: int, float, Boolean, string, and list; variables,expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, functiondefinitionanduse, flowofexecution,parametersandarguments;Illustrativeprograms:exchangethevaluesoftwovariables,circulatethevalue sof nvariables,distancebetweentwopoints.

UNIT-III	CONTROLFLOW,FUNCTIONS	9

Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else);Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and globalscope,functioncomposition,recursion;Strings:stringslices, immutability,stringfunctionsandmethods, stringmodule;Listsasarrays.Illustrativeprograms:squareroot,GCD,exponentiation,sumanarrayofnumbers,linearsearch,binarysearch.

UNIT-IV	LISTS,TUPLES,DICTIONARIES	9

Lists:listoperations,listslices,listmethods,listloop,mutability,aliasing,cloninglists,listparameters;Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - listcomprehension;Illustrativeprograms:selectionsort,insertionsort,mergesort,histogram.

UNIT-V	FILES,MODULES,PACKAGES	9

Filesandexception:textfiles,readingandwritingfiles,formatoperator; commandlinearguments, errorsand exceptions,handling exceptions,modules,packages;Illustrativeprograms:wordcount,copyfile.

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Describe the algorithmic solutions for simple computational problems.
CO2	Identify the various data, expressions and statements in python programming.
CO3	Use control flow and functions for solving problems.
CO4	Distinguish list, tuples and dictionaries in python programming.
CO5	Develop simple programs using files, modules and packages in python.

TEXTBOOKS

1. AllenB.Downey, "ThinkPython:HowtoThinkLikeaComputerScientist",2ndedition, UpdatedforPython3,ShroffO'Reilly Publishers,2016 (http://greenteapress.com/wp/thinkpython/).
2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python3.2,NetworkTheoryLtd.,2011.

REFERENCES

1. JohnVGuttag,"IntroductiontoComputationandProgramming UsingPython'',Revisedand expandedEdition,MITPress,2013.
2. Robert Sedgewick,KevinWayne,Robert Dondero,"IntroductiontoProgramminginPython: AnInter-disciplinaryApproach,PearsonIndiaEducationServicesPvt.Ltd.,2016.
3. TimothyA.Budd,"ExploringPython",Mc-GrawHillEducation(India)PrivateLtd.,2015.
4. KennethA.Lambert,"FundamentalsofPython:FirstPrograms",CENGAGELearning,2012.
5. CharlesDierbach,"IntroductiontoComputerScienceusingPython: AComputationalProblem-SolvingFocus,WileyIndiaEdition,2013.
6. PaulGries,JenniferCampbellandJasonMontojo, "PracticalProgramming:AnIntroductiontoComputerScienceusingPython3",Secondedition,Pragmatic Programmers,LLC,2013.

CO – PO MAPPING												
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CO3	3	2	1	-	-	-	-	-	-	-	-	1
CO4	3	2	1	-	-	-	-	-	-	-	-	1
CO5	3	2	1	1	-	-	-	1	-	-	-	1
CO	**3**	**2**	**1**	**1**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**1**

YEAR	I	SEMESTER	II	L	T	P	C
COURSE CODE /COURSETITLE	191ME211/ENGINEERINGGRAPHICS			2	2	0	3

COURSEOBJECTIVES

- ✓ Todevelop instudents,graphicskillsforcommunicationofconcepts,ideasanddesignofEngineeringproducts.
- ✓ Toexposethemtoexisting nationalstandards relatedto technicaldrawings.

SYLLABUS

UNIT-I	CURVESANDPICTORIALVIEWSTOORTHOGRAPHICVIEWS	8+4

Geometrical Constructions like bisection of a straight line, division of a straight line into n equal parts, bisectionof angles, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola byeccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing oftangents and normal to the above curves. Free hand sketching of multiple orthographic views from singlepictorialviewofobjects.

UNIT-II	PROJECTIONOFPOINTS,LINESANDPLANESURFACES	8+2

Orthographic projections - Introduction - Principles -Principal Planes-First angle projection. Projection of pointslocated in all quadrants. Projection of straight lines inclined to both the principal planes - Determination of truelengths and true inclinations by rotating line method,traces. Projection of planes (regular polygonal and circularsurfaces) inclinedtoboththeprincipalplanesbyrotatingobjectmethod.

UNIT-III	PROJECTION OFSOLIDS	8+2

Projection ofregularsolids byrotatingobjectmethod whentheaxisisinclinedtooneoftheprincipalplanes.

UNIT-IV	SECTIONOFSOLIDS&DEVELOPMENTOFLATERALSURFACESOFSOLIDS	8+4

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principalplanes and perpendicular to the other – obtaining true shape of the section.Development of lateral surfaces ofregular andsectionedsolids.

UNIT-V	ISOMETRICANDPERSPECTIVEPROJECTIONS	8+4

Principles of isometric projection – Isometric scale – Isometric View– Isometric projections ofsimple solids andtruncated solids – Prisms, pyramids, cylinders, cones– combination of two solid objects in simple verticalpositions.Perspectiveprojectionofsimplesolids–Prisms,pyramidsandcylindersbyvisualraymethod.

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Draw engineering curves and apply the concepts of free hand sketching.
CO2	Draw orthographic views of points, lines and surfaces.
CO3	Draw visualizations of simple solid objects as per orthographic projections.
CO4	Draw sections and developments made in drawing.
CO5	Draw pictorial drawings of simple objects.

TEXTBOOKS

- ✓ N.D.Bhatt,EngineeringDrawing,49thedition,CharotarPublishingHouse,2006.

REFERENCES

- ✓ NatarajanK.V.,"Atext bookofEngineeringGraphics",DhanalakshmiPublishers,Chennai,2009

CO – PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	2	1	-	-	-	1	1	1
CO2	3	3	3	-	2	1	-	-	-	1	1	1
CO3	3	3	3	-	2	1	-	-	-	1	1	1
CO4	3	3	3	-	2	1	-	-	-	1	1	1
CO5	3	3	3	-	2	1	-	-	-	1	1	1
CO	**3**	**3**	**3**	**-**	**2**	**1**	**-**	**-**	**-**	**1**	**1**	**1**

YEAR	I	SEMESTER	II	L	T	P	C
COURSE CODE /COURSETITLE	191AI221 /FOUNDATIONSOFDATASCIENCE			3	0	0	3

COURSEOBJECTIVES
✓ Toknowthebasicdifferencebetweendataandinformation. ✓ TolearnthebasicsofDataScience. ✓ TounderstandthevariousMethodologies availableinDataScience. ✓ TobefamiliarizedwiththeOpen-SourceTools. ✓ ToknowtheApplicationsinDataScience.

SYLLABUS		
UNIT-I	DATAANDINFORMATION	9
Data – Information – Difference between data and information – data models – Data types – File Systemversusdatabasesystem.		
UNIT-II	BASICSOFDATASCIENCE	9
What is data science? - Path to data Science – Data Science and Analysis - Requirements for Data Scientist – DataSciencetoolsandtechnology.		
UNIT-III	DATASCIENCEMETHODOLOGY	9
Problemto Approach– Requirements toCollection– UnderstandingtoPreparation– ModellingtoEvaluation –Deployment tofeedback.		
UNIT-IV	OPEN-SOURCETOOLSIN DATASCIENCE	9
DataScientist Workbench– JupyterNotebooks–ZeppelinNotebooks–PythonandR IDE		
UNIT-V	DATASCIENCEINBUSINESSAPPLICATIONS	9
Data Science in Organizations – Basics of Computer Vision – Life of Data Scientist – Applications for DataScience.		

OURSEOUTCOMES Oncompletionofthecourse,students willbeableto	
CO1	Analyze the basic difference between data and information.
CO2	Explain the basics of Data science and diagnose the tools and technology.
CO3	Apply the data science methodologies in solving complex problems.
CO4	Use the Open-source tools and interpret it.
CO5	Analyze the various tools of data science.

TEXTBOOKS

1. Blum, Avrim, John Hopcroft, and Ravindran Kannan. Foundations of Data Science. Cambridge UniversityPress,2020.
2. Hopcroft,John,andRaviKannan."Foundationsofdata science."Microsoft2014.
3. https://www.amazon.com/Art-Data-Science-Roger-Peng/dp/1365061469/.

REFERENCES

1. Fan,Jianqing, etal.StatisticalFoundationsofDataScience. CRCpress, 2020.
2. Kubben,Pieter,MichelDumontier,andAndreDekker.Fundamentalsofclinicaldata science. SpringerNature,2019
3. http://www.thedatasciencehandbook.com/
4. https://geni.us/jokq
5. https://geni.us/oR5IT6

CO – PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	-	-	1	-	-	-	-	-	1
CO2	3	2	1	-	1	1	-	-	-	-	-	1
CO3	3	2	1	-	1	1	-	-	-	-	-	1
CO4	3	2	1	1	1	1	-	-	-	-	-	1
CO5	3	2	1	1	1	1	-	-	-	-	-	1
CO	**3**	**2**	**1**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**1**

YEAR	I	SEMESTER	II	L	T	P	C
COURSE CODE /COURSETITLE	191CS22A / PROBLEM SOLVING AND PYTHONPROGRAMMINGLABORATORY			0	0	2	1

COURSEOBJECTIVES

- ✓ Write,test,anddebugsimplePythonprograms.
- ✓ Implement Pythonprogramswithconditionalsandloops.
- ✓ Usefunctionsfor structuringPythonprograms.
- ✓ RepresentcompounddatausingPythonlists, tuples,anddictionaries.
- ✓ Readandwritedatafrom/tofilesinPython.

SYLLABUS

LIST OFEXPERIMENTS

1. ComputetheGCDoftwo numbers.
2. Findthesquareroot ofanumber(Newton‘smethod)
3. Exponentiation(powerofanumber)
4. Findthemaximumofalist ofnumbers
5. LinearsearchandBinarysearch
6. Selectionsort,Insertionsort
7. Mergesort
8. First nprimenumbers
9. Multiplymatrices
10. Programsthattakecommandlinearguments (wordcount)
11. Findthemostfrequentwordsinatextreadfromafile
12. SimulateellipticalorbitsinPygame
13. SimulatebouncingballusingPygame.
14. Pythonversions,advancements andapplicationsofpython-CaseStudy.
15. Miniproject

PLATFORMNEEDEDPython3interpreterfor Windows/Linux

COURSEOUTCOMES

Oncompletionofthecourse,students willbeableto

CO1	Solve problems using conditionals and loops in Python.
CO2	Develop Python programs by defining functions.

CO3	Use lists, tuples and dictionaries for solving complex problems in python programming.
CO4	Createpython programs using files.

CO – PO MAPPING												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1	1	-	-	-	-	-	-	-	1
CO2	3	2	1	1	-	-	-	-	-	-	-	1
CO3	3	2	1	1	-	-	-	-	-	-	-	1
CO4	3	2	1	1	-	-	-	-	-	-	-	1
CO	**3**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

YEAR	I	SEMESTER	II	L	T	P	C
COURSE CODE /COURSETITLE	191ME21A/ENGINEERINGPRACTICESLABORATORY			0	0	4	2

COURSEOBJECTIVES

- ✓ Toprovideexposuretothestudentswithhandsonexperienceonvariousbasic engineering practices inCivil,Mechanical,ElectricalandElectronicsEngineering.

GROUPA(CIVIL&MECHANICAL)

ICIVILENGINEERINGPRACTICE **13**

Buildings:

(a)Study ofplumbingandcarpentrycomponents ofresidentialandindustrialbuildings,Safetyaspects.

PlumbingWorks:

(a) Studyofpipelinejoints,itslocationandfunctions:valves,taps,couplings,unions,reducers,andelbowsinhouseholdfittings.

(b) Studyofpipeconnectionsrequirementsforpumpsandturbines.

(c) Preparationofplumbinglinesketches forwatersupplyandsewageworks.

(d) Hands-on-exercise:Basicpipeconnections–Mixedpipematerialconnection– Pipeconnectionswithdifferentjoiningcomponents.

(e) Demonstrationofplumbingrequirementsofhigh-risebuildings.

CarpentryusingPowerToolsonly:

(a) Studyofthejoints inroofs,doors,windowsandfurniture.

(b) Hands-on-exercise:Woodwork,jointsbysawing,planningandcutting.

IIMECHANICALENGINEERINGPRACTICE **18**

Welding:
(a) Preparationofbuttjoints,lapjointsandT-jointsbyShieldedmetalarcwelding.
(b) Gasweldingpractice

BasicMachining:
(a) SimpleTurningandTaperturning
(b) DrillingPractice

SheetMetalWork:
(a)Forming&Bending:(b)Modelmaking– Traysandfunnels.(c)Differenttypeofjoints.Machine

Assemblypractice:
(a) Studyofcentrifugalpump
(b) Studyofair conditioner

Demonstrationon:
(a) Smithyoperations,upsetting,swaging,settingdownandbending.Example–Exercise–Productionofhexagonalheadedbolt.
(b) Foundryoperationslikemouldpreparationforgearandstepconepulley.Fittin g–Exercises–Preparationof squarefittingandV–fittingmodels

GROUPB(ELECTRICAL&ELECTRONICS)

IIIELECTRICALENGINEERINGPRACTICE **13**

1. Residentialhousewiringusingswitches,fuse,indicator, lampandenergymeter.
2. Fluorescentlampwiring.
3. Staircasewiring
4. Measurementofelectricalquantities–voltage, current,power &powerfactorinRLCcircuit.
5. Measurementofenergyusingsinglephaseenergymeter.
6. Measurement ofresistancetoearthofanelectrical equipment.

IV ELECTRONICSENGINEERINGPRACTICE **16**

1. StudyofElectroniccomponentsandequipments– Resistor,colorcodingmeasurementofACsignalparameter(peak-peak,rmsperiod,frequency)usingCR.
2. Studyoflogicgates AND,OR,EX-ORandNOT.
3. GenerationofClockSignal.
4. Solderingpractice–Components DevicesandCircuits–UsinggeneralpurposePCB.
5. MeasurementofripplefactorofHWRandFWR.

TOTAL **60Periods**

LISTOFEQUIPMENTS
Requirementsforabatchof30 students

S.NO	DescriptionoftheEquipment	QuantityRequired
1	Assortedcomponentsforplumbingconsistingofmetallicpipes,plastic pipes, flexiblepipes, couplings,unions, elbows,plugsandotherfittings.	15sets
2	Carpentryvice(fittedtoworkbench)	15Nos.
3	Standardwoodworkingtools	15sets
4	Modelsofindustrialtrusses, doorjoints,furniturejoints	5 Each
5	PowerTools: a) RotaryHammer b) DemolitionHammer c) CircularSaw d) Planer e) HandDrillingMachine f) Jigsaw	 2Nos 2Nos 2Nos. 2Nos. 2Nos. 2Nos.
	MECHANICAL	
1	Arcweldingtransformerwithcablesandholders	5Nos
2	Weldingboothwithexhaust facility	5Nos
3	Weldingaccessorieslikeweldingshield,chippinghammer, wirebrush,etc.	5Nos
4	Oxygenandacetylenegascylinders, blowpipeandotherwelding outfit.	2Nos
5	Centrelathe	2Nos
6	Hearthfurnace,anvilandsmithytools	2Nos
7	Mouldingtable, foundrytools	2Nos
8	PowerTool:AngleGrinder	2Nos
9	Study-purposeitems:centrifugalpump,air-conditioner	OneEach
	ELECTRICAL	
1	Assortedelectricalcomponentsfor housewiring	15Nos
2	Electricalmeasuringinstruments	10Nos
3	Studypurposeitems:Ironbox,fanandregulator,emergency Lamp	1 No
4	Megger (250V/500V)	1 No
5	PowerTools: (a) RangeFinder (b) DigitalLive-wiredetector	 2Nos 2Nos
	ELECTRONICS	
1	Solderingguns	10Nos
2	Assortedelectroniccomponentsformakingcircuits	50Nos
3	SmallPCBs	10Nos
4	Multimeters	10Nos
5	Studypurposeitems:Telephone,FMradio, low-voltagepowersupp	

COURSEOUTCOMES Oncompletionofthecourse,students willbeableto	
CO1	Use mechanical and civil engineering equipments to join the structures and perform basic machining operations and fabricate models in sheet meta
CO2	Use electrical and electronics engineering equipments to test the respective electrical and electronic parameters

CO – PO MAPPING												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	2	2	2	-	-	-	1	1	1
CO2	3	3	3	2	2	2	-	-	-	1	1	1
CO	**3**	**3**	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**1**	**1**	**1**

SEMESTER-III

YEAR	II	SEMESTER	III	L	T	P	C
COURSE CODE /COURSETITLE	191MA303 /PROBABILITY ANDSTATISTICS			2	2	0	3

COURSEOBJECTIVES
✓ Introducedtothenotionofsamplingdistributionsandhaveacquiredknowledgeofstatisticaltechniques usefulinmakingrationaldecisioninmanagementproblems. ✓ Exposedtostatisticalmethods designedtocontributetotheprocessofmakingscientificjudgmentsintheface ofuncertaintyandvariation.

SYLLABUS		
UNIT-I	PROBABILITYANDRANDOMVARIABLES	9
Probability -Axioms of probability – Conditional probability– Baye's theorem - Random variable - Probabilitymass function - Probability density function - Cumulative distribution function - Moments - Moment generatingfunctions.		
UNIT-II	STANDARDDISTRIBUTIONS	9
Discretedistributions -Binomial,Poisson,Geometricdistributions-Continuousdistributions-Uniform - ExponentialandNormaldistributions.		
UNIT-III	TWODIMENSIONAL RANDOMVARIABLES	9
Random variables - One and two dimensional random variables-Joint distributions - Marginal and conditionaldistributions–Covariance-Correlationandregression.		
UNIT-IV	TESTINGOFHYPOTHESIS	9
Samplingdistributions-Largesampletest:Testsformean- Smallsampletests:Tests formean(ttest),F-test-Chi-squaretestforGoodnessof fitandIndependenceof attributes.		
UNIT-V	DESIGNOFEXPERIMENTS	9
Analysis of Variance- One way and two way classifications - Completely randomized design – Randomizedblockdesign–Latinsquaredesign.		

COURSEOUTCOMES Oncompletionofthecourse,students willbeableto	
CO1	Demonstrateandapplythebasic probabilityaxiomsandconceptsintheircoreareas.
CO2	Analyzetheconceptsofprobabilitydistributionsinanappropriateplaceofscienceand Engineering.
CO3	Calculatetherelationshipoftwodimensionalrandomvariables usingcorrelationtechniques andtostudythepropertiesof twodimensionalrandomvariables.
CO4	Applytheconceptoftestingofhypothesis forsmallandlargesamples inreallifeproblems.
CO5	Identifytheclassificationofdesign ofexperiment intheirrespectivefields.

TEXTBOOKS

1. Johnson,R.A.,Miller, IandFreundJ.,"MillerandFreund'sProbabilityandStatisticsforEngineers",PearsonEducation,Asia,8thEdition,2015.
2. Peebles. P.Z.,"Probability, RandomVariablesandRandomSignalPrinciples", TataMcGrawHill,4thEdition,NewDelhi,2002.

REFERENCES

1. Yates. R.D.andGoodman. D.J.,"ProbabilityandStochasticProcesses", 2ndEdition, WileyIndiaPvt.Ltd.,Bangalore,2012.
2. Stark. H.,andWoods.J.W.,"ProbabilityandRandomProcesseswithApplicationstoSignalProcessing",3rdEdition,PearsonEducation,Asia,2002.
3. Spiegel.M.R.,Schiller. J.andSrinivasan. R.A.,"Schaum'sOutlinesonProbabilityandStatistics", TataMcGrawHillEdition,2004.
4. Walpole.R.E.,Myers.R.H.,Myers.S.L.andYe.K.,"ProbabilityandStatisticsfor EngineersandScientists",8thEdition,PearsonEducation,Asia,2007.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	-	-	-	-	-	-	1
CO2	3	3	2	2	1	-	-	-	-	-	-	1
CO3	3	3	2	2	1	-	-	-	-	-	-	1
CO4	3	3	2	2	1	-	-	-	-	-	-	1
CO5	3	3	2	2	1	-	-	-	-	-	-	1
CO	3	3	**2**	**2**	1	-	-	-	-	-	-	1

YEAR	II	SEMESTER	III	L	T	P	C
COURSE CODE /COURSETITLE	191AI321/DATASTRUCTURES			3	0	0	3

COURSEOBJECTIVES
✓ Define thebasic concepts ofADTs used in python. ✓ Designthe lineardatastructures–lists,stacks,andqueues using python. ✓ Analyze the various sorting,searchingand hashingalgorithms. ✓ Construct the treeandgraphstructures using python.

SYLLABUS		
UNIT-I	ABSTRACTDATATYPES	9
AbstractDataTypes(ADTs)–ADTsandclasses–introductiontoOOP–classesinPython–inheritance–namespaces–shallowanddeepcopyingIntroductiontoanalysisofalgorithms–asymptoticnotations–recursion –analyzingrecursivealgorithms.		
UNIT-II	LINEARSTRUCTURES	9
ListADT–array-basedimplementations–linkedlistimplementations–singlylinkedlists–circularlylinkedlists–doublylinkedlists–applicationsoflists–StackADT–QueueADT–doubleendedqueues.		
UNIT-III	SORTINGANDSEARCHING	9
Bubble sort – selection sort – insertion sort – merge sort – quick sort – linear search – binary search – hashing – hashfunctions–collisionhandling–loadfactors,rehashing,andefficiency.		
UNIT-IV	TREESTRUCTURES	9
TreeADT–BinaryTreeADT– treetraversals–binary searchtrees–AVLtrees–heaps–multi-waysearchtrees		
UNIT-V	GRAPHSTRUCTURES	9
GraphADT–representationsofgraph–graphtraversals– DAG–topologicalordering–shortestpaths – minimumspanningtrees		

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	DemonstratetheconceptsofADTandexplainthelist datastructuresanditsapplications.
CO2	Analyze,designlinear data structures-Stacks&queuesusingarrayandpointerimplementations.
CO3	Evaluatesorting, searchingandhashingalgorithms.
CO4	Designanddeveloptreedatastructuresanditstraversalalgorithms.
CO5	Developvariousnonlineardatastructures.

TEXTBOOKS

1. Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, "Data Structures&AlgorithmsinPython",JohnWiley&SonsInc.,2013
2. Lee,KentD.,Hubbard,Steve,"DataStructuresandAlgorithmswithPython"SpringerEditi on2015

REFERENCES

1. RanceD.Necaise,"DataStructuresandAlgorithmsUsingPython",JohnWiley&Sons,201 1
2. Aho,Hopcroft,andUllman, "DataStructuresandAlgorithms",PearsonEducation,1983.
3. ThomasH.Cormen,CharlesE.Leiserson,RonaldL.Rivest,andCliffordStein, "IntroductiontoAlgorithms",SecondEdition,McGrawHill,2002.
4. MarkAllenWeiss,"DataStructuresandAlgorithmAnalysisinC++",FourthEdition, PearsonEducation,2014.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	2	-	-	-	-	-	1
CO2	3	3	3	2	2	2	-	-	-	-	-	1
CO3	3	3	3	2	2	1	-	-	-	-	-	1
CO4	3	3	3	2	2	2	-	-	-	-	-	1
CO5	3	3	3	2	2	1	-	-	1	-	-	1
CO	3	3	3	2	2	2	-	-	-	-	-	1

YEAR	II	SEMESTER	III	L	T	P	C
COURSE CODE /COURSETITLE	191CS322/COMPUTERARCHITECTURE			3	0	0	3

COURSEOBJECTIVES

- ✓ To conceptualize thebasicstructureandoperations ofacomputer.
- ✓ Tostudythe basic working principles of arithmeticandlogicunitand implement fixed-point andfloatingpointarithmeticalgorithms.
- ✓ Tolearnthebasics ofpipelined execution.
- ✓ Tounderstandparallelismandmulti-coreprocessors.
- ✓ To describethe concepts of memoryhierarchies,cachememoriesandvirtualmemories.

SYLLABUS

UNIT-I	BASICSTRUCTUREOFACOMPUTERSYSTEM	9

Functional Units – Basic Operational Concepts – Performance – Instructions: Language of the Computer – Operations,Operands–Instructionrepresentation– Logicaloperations–decisionmaking–MIPSAddressing

UNIT-II	ARITHMETICFORCOMPUTERS	9

Addition and Subtraction – Multiplication – Division – Floating Point Representation – Floating Point Operations –Sub wordParallelism.

UNIT-III	PROCESSORANDCONTROLUNIT	9

A Basic MIPS implementation – Building a Data path – Control Implementation Scheme – Pipelining – Pipelineddata pathandcontrol–HandlingDataHazards&ControlHazards–Exceptions.

UNIT-IV	PARALLELISIM	9

Parallel processing challenges – Flynn‘s classification – SISD, MIMD, SIMD, SPMD, and Vector Architectures -Hardware multithreading – Multi-core processors and other Shared Memory Multiprocessors - Introduction toGraphicsProcessing Units,Clusters,WarehouseScaleComputersandotherMessage-PassingMultiprocessors.

UNIT-V	MEMORY &I/OSYSTEMS	9

Memory Hierarchy - memory technologies – cache memory – measuring and improving cache performance – virtualmemory, TLB‘s – Accessing I/O Devices – Interrupts – Direct Memory Access – Bus structure – Bus operation –Arbitration–Interfacecircuits–USB, Case Study- PARAM Siddhi - AI**.**

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Define thebasics concepts of fundamental component, architecture, register organization and performance metrics of a computer.
CO2	Illustrate the efficient algorithm for binary arithmetic operations.
CO3	Construct an efficient data path for an instruction format for a given architecture.
CO4	Categorize various parallel processors.
CO5	Analyze the memory,I/O devices and cache structures for processor.

TEXTBOOKS

1. DavidA.PattersonandJohnL.Hennessy,ComputerOrganizationandDesign:TheHardware/SoftwareInterface,FifthEdition,MorganKaufmann/Elsevier,2014.
2. CarlHamacher, ZvonkoVranesic, Safwat ZakyandNaraigManjikian, ComputerOrganizationandEmbeddedSystems,SixthEdition,Tata McGrawHill,2012.

REFERENCES

1. WilliamStallings,ComputerOrganizationandArchitecture– DesigningforPerformance,EighthEdition,PearsonEducation,2010.
2. JohnP.Hayes,ComputerArchitectureandOrganization,ThirdEdition, TataMcGrawHill, 2012.
3. JohnL.HennesseyandDavidA.Patterson,ComputerArchitecture– AQuantitativeApproach,MorganKaufmann/ElsevierPublishers,FifthEdition,2012.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	1	1	1	1	1	-	-
CO2	3	3	2	2	1	1	1	1	1	1	-	-
CO3	3	3	2	2	1	1	1	-	1	-	1	1
CO4	3	3	2	2	1	1	-	1	1	-	1	1
CO5	3	3	2	2	1	1	1	1	1	1	1	1
CO	**3**	**3**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**

YEAR	II	SEMESTER	III	L	T	P	C
COURSE CODE /COURSETITLE	191CS323/OBJECTORIENTEDPROGRAMMING			3	0	0	3

COURSEOBJECTIVES

- ✓ TounderstandObject OrientedProgrammingconcepts andbasiccharacteristicsofJava.
- ✓ Toknowtheprinciples ofpackages,inheritanceandinterfaces.
- ✓ Todefineexceptions anduseI/Ostreams.
- ✓ Todevelopajavaapplicationwiththreadsandgenericsclasses.
- ✓ TodesignandbuildsimpleGraphicalUserInterfaces.

SYLLABUS

UNIT-I	INTRODUCTIONTOOOPANDJAVAFUNDAMENTALS	9

Object Oriented Programming - Abstraction - objects and classes – Encapsulation- Inheritance – Polymorphism-OOPinJava - Characteristics ofJava–TheJavaEnvironment-JavaSourceFile–Structure - Compilation.FundamentalProgrammingStructuresinJava– DefiningclassesinJava–constructors,methods–access-specifiers- static members -Comments, Data Types, Variables, Operators,Control Flow, Arrays,Packages – Java Doccomments.

UNIT-II	INHERITANCEANDINTERFACES	9

Inheritance – Super classes - sub classes - Protected members - constructors in sub classes - The Object class – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementinginterface,differencesbetweenclassesandinterfacesandextending interfaces–Objectcloning-inner classes,ArrayLists - Strings.

UNIT-III	EXCEPTIONHANDLINGANDI/O	9

Exceptions - Exception hierarchy - Throwing and catching exceptions - Built-in exceptions, creating ownexceptions, Stack Trace Elements. Input/ Output Basics – Streams – Byte streams and Character streams –ReadingandWritingConsole–ReadingandWritingFiles.

UNIT-IV	MULTITHREADINGANDGENERICPROGRAMMING	9

Differencesbetweenmulti-threadingandmultitasking,Threadlifecycle, Creatingthreads,Synchronizingthreads, Inter-thread communication, Thread priorities, Daemon threads, Thread groups. Generic Programming– Generic classes – genericmethods–BoundedTypes–RestrictionsandLimitations.

UNIT-V	EVENTDRIVENPROGRAMMING	9

Applets: Basics, Applet class, Applet Architecture, Applet skeleton. Graphics programming – Frame - Components – working with 2D shapes – Using color, fonts, and images –Basicsofeventhandling–eventhandlers–adapterclasses –actions–mouseevents–AWTeventhierarchy–Introduction to Swing – layout management – Swing Components - Text Fields, Text Areas – Buttons- CheckBoxes–RadioButtons–Lists- choices- Scrollbars–Windows–Menus–DialogBoxes.

COURSEOUTCOMES	
Oncompletionof thecourse,students willbeableto	
CO1	AcquireknowledgeinOOPSconceptanddefinethestructureof Javaprograms.
CO2	Identify theconceptofinheritance, interfacesandillustratetheJavaPrograms.
CO3	DevelopJavaapplicationsusingExceptionsandI/Ostreams
CO4	Analyzeand evaluatetheconcept ofthreadsandgenericclassestodevelop Javaapplications
CO5	CreateinteractiveJavaprogramsusingAWTandSwings

TEXTBOOKS

1. HerbertSchildt, - "Java, Thecompletereference",8thEdition, McGrawHillEducation.
2. CayS.Horstmann,Garycornell, "CoreJavaVolume–IFundamental",9thEdition,PrenticeHall,2013.

REFERENCES

1. PaulDeitel,HarveyDeitel,"JavaSE8forprogrammers",3rdEdition, Pearson,2015.
2. StevenHolzner,"Java2Blackbook",Dream techpress,2011.
3. TimothyBudd, "UnderstandingObject-orientedprogrammingwithJava",UpdatedEdition, PearsonEducation,2000.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
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CO3	3	2	2	1	-	-	-	1	-	-	-	1
CO4	3	2	2	1	-	-	1	1	-	-	-	1
CO5	3	3	2	1	1	-	1	1	-	-	-	1
CO	**3**	**2**	**2**	**1**	**1**	**-**	**1**	**1**	**-**	**-**	**-**	**1**

YEAR	II	SEMESTER	III	L	T	P	C
COURSE CODE /COURSETITLE	191CS324/SOFTWAREENGINEERING			3	0	0	3

COURSEOBJECTIVES

- ✓ Learn thephasesinasoftwareproject.
- ✓ Analyze fundamentalconceptsofrequirementsengineeringandAnalysisModeling.
- ✓ Studythevarioussoftwaredesignmethodologies.
- ✓ Explore varioustestingandmaintenancemeasures.

SYLLABUS

UNIT-I	SOFTWAREPROCESSANDAGILEDEVELOPMENT	9

Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models – IntroductiontoAgility–Agileprocess–Extremeprogramming-XPProcess

UNIT-II	REQUIREMENTSANALYSISANDSPECIFICATION	9

Software Requirements: Functional and Non-Functional, User requirements, System requirements, SoftwareRequirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation andanalysis,requirementsvalidation,requirementsmanagement-Classicalanalysis:StructuredsystemAnalysis,PetriNets- DataDictionary

UNIT-III	SOFTWAREDESIGN	9

Design process – Design Concepts-Design Model– Design Heuristic – Architectural Design -Architectural styles,ArchitecturalDesign, ArchitecturalMappingusingDataFlow-Design Patterns-Types - UserInterfaceDesign:Interfaceanalysis,InterfaceDesign– ComponentlevelDesign:Designingclassbasedcomponents,Traditionalcomponents.

UNIT-IV	TESTINGANDMAINTENANCE	9

Software testing fundamentals-Internal and external views of Testing-white box testing - basis path testing-controlstructure testing-black box testing- Regression Testing – Unit Testing – Integration Testing – Validation Testing –System Testing and Debugging –Software Implementation Techniques: Coding practices-Refactoring-MaintenanceandReengineering-BPRmodel-Reengineeringprocessmodel-ReverseandForwardEngineering - Testing the documentation.

UNIT-V	PROJECTMANAGEMENT	9

Software Project Management: Estimation – LOC, FP Based Estimation, Make/Buy Decision COCOMO I & IIModel – Project Scheduling – Scheduling, Earned Value Analysis Planning – Project Plan, Planning Process, Critical Path (CRM) Method - RFPRiskManagement–Identification,Projection-RiskManagement-RiskIdentification-RMMMPlan-CASETOOLS

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Remember thekeyactivitiesinmanagingasoftware project.
CO2	Identify differentprocessmodelsandtheapproachadoptedingatheringrequirements.
CO3	Applysystematicprocedurefor softwaredesign anddeployment.
CO4	Analyze, compareandcontrastthevarioustestingandmaintenance.
CO5	Evaluate the Managementprojectschedule,estimateprojectcostandeffortrequired.

TEXTBOOKS

1. Roger S.Pressman, ―SoftwareEngineering–APractitioner'sApproach,SeventhEdition,McGraw-HillInternationalEdition,2010.
2. IanSommerville, ―SoftwareEngineering‖,9thEdition,PearsonEducationAsia,2011.

REFERENCES

1. RajibMall, ―FundamentalsofSoftwareEngineering, ThirdEdition, PHILearningPrivateLimited,2009.
2. PankajJalote, ―SoftwareEngineering,APreciseApproach,WileyIndia,2010.
3. Kelkar S.A.,―SoftwareEngineering, PrenticeHallof IndiaPvtLtd,2007.
4. StephenR.Schach,―SoftwareEngineering,TataMcGraw-HillPublishingCompanyLimited,2007.
5. http://nptel.ac.in/.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	-	-	-	-	-	-	-	-
CO2	3	2	1	1	-	-	-	-	-	-	1	-
CO3	3	2	2	1	1	-	-	-	1	2	1	1
CO4	3	2	1	1	1	-	1	1	2	2	2	2
CO5	3	2	2	1	1	2	1	1	2	1	2	2
CO	3	2	1	1	1	1	1	1	1	1	1	1

YEAR	II	SEMESTER	III	L	T	P	C
COURSE CODE /COURSETITLE	191AI322/INTRODUCTIONTOARTIFICIALINTELLIGENCE			3	0	0	3

COURSEOBJECTIVES
✓ Define thevariouscharacteristicsofIntelligentagents. ✓ Compare thedifferentsearchstrategies inAI. ✓ ApplyknowledgeinsolvingAIproblems. ✓ Describeaboutexpertsystem. ✓ UsethevariousapplicationsofAI.

SYLLABUS		
UNIT-I	INTRODUCTION	9
History - Definition - Environment, Futureof ArtificialIntelligence- CharacteristicsofIntelligentAgents - TypicalIntelligentAgents - ProblemSolvingApproachtoTypicalAIproblems.		
UNIT-II	PROBLEMSOLVINGMETHODS	9
Problem solving Methods –Search Strategies - Local Search Algorithms and Optimization Problems - searchingwithPartialObservations–ConstraintSatisfactionProblems-AdversarialSearchandGames.		
UNIT-III	KNOWLEDGEREPRESENTATION	9
KnowledgeRepresentation-KnowledgebasedAgents-RepresentingKnowledgeusingRules-SemanticNetworks-FrameSystems-Inference–Typesof Reasoning.		
UNIT-IV	EXPERTSYSTEM&GAMETHEORY	9
Important Concepts of Game Theory -Game Playing and Knowledge Structure-Game as a Search Problem - Alpha-betaPruning-GameTheoryProblemsGameTheory, Expert System-Architecture- Knowledge acquisition-Rule based Expert System-Frame based and Fuzzy basedexpertsystem		
UNIT-V	APPLICATIONS	9
AI applications – Language Models – Information Retrieval- Information Extraction – Natural LanguageProcessing-MachineTranslation–SpeechRecognition– Robot– Hardware–Perception– Planning–Moving		

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	CompareAIwithhumanintelligenceandtraditionalinformationprocessing
CO2	Useappropriatesolvingapproaches ondifferentAIproblems
CO3	ApplybasicprinciplesofAIinsolutionsthatrequireproblemsolving, inference, perception, knowledge Representationandlearning.
CO4	Analyze proficiencydevelopingapplicationsinan'AIlanguage',expert systemshell.
CO5	Designsoftwareagents for communication and component involved in intelligent systems

TEXTBOOKS

1. S.RussellandP. Norvig,"ArtificialIntelligence: AModernApproach",PrenticeHall,ThirdEdition,2009.
2. I. Bratko, ―Prolog: Programming for Artificial Intelligence, Fourth edition, Addison-Wesley educationalpublishersInc., 2011.

REFERENCES

1. M.TimJones,ArtificialIntelligence:ASystemsApproach(ComputerScience),JonesandBartlettPublishers,Inc.;FirstEdition,2008
2. NilsJ.Nilsson, TheQuestfor ArtificialIntelligence,CambridgeUniversityPress,2009.
3. WilliamF.ClocksinandChristopherS.Mellish,ProgramminginProlog:UsingtheISOStandard,FifthEdition,Springer,2003.
4. GerhardWeiss,―MultiAgentSystems‖,SecondEdition,MITPress,2013.
5. DavidL.PooleandAlanK.Mackworth,―ArtificialIntelligence:FoundationsofComputationalAgents, CambridgeUniversityPress,2010.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	-	-	-	-	-	-	-	1
CO2	3	2	2	1	1	-	-	-	-	-	-	1
CO3	3	2	2	2	1	-	-	-	-	-	-	1
CO4	3	2	2	2	1	1	-	-	-	-	-	1
CO5	3	2	2	2	1	1	-	-	-	-	-	1
CO	**3**	**2**	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**1**

YEAR	II	SEMESTER	III	L	T	P	C
COURSE CODE /COURSETITLE	191AI32A/DATASTRUCTURESLABORATORY			0	0	2	1

COURSEOBJECTIVES

- ✓ ImplementADTsinPython.
- ✓ Designandimplementlineardatastructures–lists,stacks,andqueues.
- ✓ Implement sorting, searchingandhashingalgorithms.
- ✓ Solveproblemsusingtreeandgraphstructures.

SYLLABUS

LIST OFEXPERIMENTS

1. Implement simpleADTsasPythonclasses
2. ImplementrecursivealgorithmsinPython
3. ImplementListADTusingPythonarrays
4. LinkedlistimplementationsofList
5. Implementation ofStackandQueueADTs
6. ApplicationsofList,StackandQueueADTs
7. Implementationofsortingandsearchingalgorithms
8. ImplementationofHashtables
9. Treerepresentationandtraversalalgorithms
10. ImplementationofBinarySearchTrees
11. ImplementationofHeaps
12. GraphrepresentationandTraversalalgorithms
13. Implementationofsinglesourceshortestpathalgorithm
14. Implementationofminimumspanningtreealgorithms

COURSEOUTCOMES

Oncompletionofthecourse,studentswill beableto

CO1	DemonstratetheconceptsofADTandexplainthelist datastructuresanditsapplications.
CO2	Analyze,designlinear data structures - Stacks&queuesusingarrayandpointerimplementations.
CO3	Evaluatesorting, searchingandhashingalgorithms.
CO4	Designanddeveloptreedatastructuresanditstraversalalgorithms.
CO5	Developvariousnonlineardatastructures.

TEXTBOOKS

- ✓ Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, "Data Structures & Algorithms inPython",JohnWiley&SonsInc.,2013.

REFERENCES

1. RanceD.Necaise,"DataStructuresandAlgorithmsUsingPython",JohnWiley&Sons,2011
2. Aho,Hopcroft,andUllman,"DataStructuresandAlgorithms",PearsonEducation,1983.
3. ThomasH. Cormen,CharlesE.Leiserson, RonaldL. Rivest,andCliffordStein, "IntroductiontoAlgorithms",SecondEdition,McGrawHill,2002.
4. MarkAllenWeiss,"DataStructuresandAlgorithmAnalysisinC++",FourthEdition,PearsonEducation,2014.

CO- PO MAPPING

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CO1	3	3	3	2	3	1	1	1	1	2	3	3
CO2	3	3	3	2	3	1	1	1	1	2	3	3
CO3	3	3	3	2	3	1	1	1	1	2	3	3
CO4	3	3	3	2	3	1	1	1	1	2	3	3
CO5	3	3	3	2	3	1	1	1	1	2	3	3
CO	3	3	3	2	3	1	1	1	1	2	3	3

YEAR	II	SEMESTER	III	L	T	P	C
COURSE CODE /COURSETITLE	191CS32B/OBJECTORIENTEDPROGRAMMINGLABORATORY			0	0	2	1

COURSEOBJECTIVES

- ✓ Develop applications using Object Oriented Programming Concepts
- ✓ Develop and implement Java programs principles of packages, inheritance and interfaces.
- ✓ Develop and implement Java programs for simple applications that make use of classes, packages and interfaces.
- ✓ Develop and implement Java programs with array list, exception handling and multithreading.
- ✓ Design applications using file processing, generic programming and event handling.

LIST OF EXPERIMENTS

1	Develop a Java application to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection (i.e domestic or commercial). Compute the bill amount using the following tariff. If the type of the EB connection is domestic, calculate the amount to be paid as follows: • First 100 units - Rs. 1 per unit • 101-200 units - Rs. 2.50 per unit • 201 -500 units - Rs. 4 per unit • > 501 units - Rs. 6 per unit If the type of the EB connection is commercial, calculate the amount to be paid as follows: • First 100 units - Rs. 2 per unit • 101-200 units - Rs. 4.50 per unit • 201 -500 units - Rs. 6 per unit • > 501 units - Rs. 7 per unit
2	Develop a java application to implement currency converter (Dollar to INR, EURO to INR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM and vice versa), time converter (hours to minutes, seconds and vice versa) using packages.
3	Develop a java application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.
4	Design a Java interface for ADT Stack. Implement this interface using array. Provide necessary exception handling in both the implementations.
5	Write a program to perform string operations using Array List. Write functions for the following a. Append - add at end b. Insert – add at particular index c. Search d. List all string starts with given letter
6	Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.

7	Write a Java program to implement user defined exception handling.
8	Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes.
9	Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
10	Write a java program to find the maximum value from the given type of elements using a generic function.
11	Design a calculator using event-driven programming paradigm of Java with the following options. a. Decimal manipulations b. Scientific manipulations
12	Applet program implementing Graphics Applications.
13	Develop a mini project for any application using Java concepts.

COURSEOUTCOMES Oncompletionofthecourse,students willbeableto	
CO1	Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects.
CO2	Analyze the concept of function overloading, operator overloading, virtual functions and polymorphism.
CO3	Implement Java programs for simple applications that make use of classes, packages and interfaces.
CO4	Develop and implement Java programs with array list, exception handling and multithreading.
CO5	Design applications using file processing, generic programming and event handling.

TEXT BOOKS

1. HerbertSchildt, ―JavaThecompletereference‖,8thEdition, McGrawHillEducation.
2. CayS.Horstmann,Garycornell,―CoreJavaVolume–IFundamental‖,9thEdition,PrenticeHall,2013.

REFERENCES

1. PaulDeitel,HarveyDeitel,“JavaSE8forprogrammers”,3rdEdition, Pearson,2015.
2. StevenHolzner,“Java2Blackbook”, Dream techpress,2011.
3. TimothyBudd, “UnderstandingObject-orientedprogrammingwithJava”,UpdatedEdition, PearsonEducation, 2000.

CO- PO MAPPING												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	2	3	1	1	1	1	2	3	3
CO2	3	3	3	2	3	1	1	1	1	2	3	3
CO3	3	3	3	2	3	1	1	1	1	2	3	3
CO4	3	3	3	2	3	1	1	1	1	2	3	3
CO5	3	3	3	2	3	1	1	1	1	2	3	3
CO	**3**	**3**	**3**	**2**	**3**	**1**	**1**	**1**	**1**	**2**	**3**	**3**

YEAR	II	SEMESTER	III	L	T	P	C
COURSE CODE /COURSETITLE	191HS30A/ADVANCEDREADINGANDWRITING SKILLS LABORATORY			0	0	2	1

COURSEOBJECTIVES

- Develop their communicative competence in English with specific reference to speaking and listening
- Enhance their ability to communicate effectively in interviews.
- Strengthen their prospects of success in competitive examinations.

SYLLABUS

UNIT-I		**12**

Reading – Strategies for effective reading-Use glosses and footnotes to aid reading comprehension- Read and recognize different text types-Predicting content using photos and title **Writing**-Plan before writing- Develop a paragraph: topic sentence, supporting sentences, concluding sentence –Write a descriptive paragraph

UNIT-II		

Reading-Read for details-Use of graphic organizers to review and aid comprehension Writing-State reasons and examples to support ideas in **writing**– Write a paragraph with reasons and examples- Write an opinion paragraph

UNIT-III		**12**

Reading– Understanding pronoun reference and use of connectors in a passage- speed reading techniques-**Writing**– Elements of good essay-Types of essays- descriptive-narrative- issue-based-argumentative-analytical.

UNIT-IV		**12**

Reading– Genre and Organization of Ideas- **Writing**– Email writing- visumes – Job application- project writing-writing convincing proposals.

UNIT-V		**12**

Reading– Critical reading and thinking- understanding how the text positions the reader- identify **Writing**– Statement of Purpose- letter of recommendation- Vision statement

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Demonstrate understanding of elements of writing such as brainstorming for generating topic sentence, central ideas, supporting ideas, organization patterns, editing and drafting different types of paragraphs and essays.
CO2	Understand the strategies of skimming and scanning to read a text analytically and critically respond to it.
CO3	Apply critical thinking skills and infer a text logically in relation to various professional concerns.

TEXTBOOKS

1. Gramer F. Margot and Colin S. Ward Reading and Writing (Level 3) Oxford University Press: Oxford, 2011.
2. Debra Daise, CharlNorloff, and Paul Carne Reading and Writing (Level 4) Oxford University Press: Oxford, 2011

REFERENCES

1. Davis, Jason and Rhonda LIss. Effective Academic Writing (Level 3) Oxford University Press: Oxford, 2006.
2. E. Suresh Kumar and et al. Enriching Speaking and Writing Skills. Second Edition. Orient Black swan: Hyderabad, 2012.
3. Withrow, Jeans and et al. Inspired to Write. Readings and Tasks to develop writing skills. Cambridge University Press: Cambridge, 2004.
4. Goatly, Andrew. Critical Reading and Writing. Routledge: United States of America, 2000.
5. Petelin, Roslyn and Marsh Durham. The Professional Writing Guide: Knowing Well and Knowing Why. Business & Professional Publishing: Australia, 2004.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	3	3	2	2
CO2	3	-	-	-	-	-	-	-	3	3	2	2
CO3	3	-	-	-	-	-	-	-	3	3	2	2
CO	**3**	-	-	-	-	-	-	-	**3**	**3**	**2**	**2**

SEMESTER–IV

CourseCode	Nameof theCourse	Category	L	T	P	Credits
191MA403	Discrete Mathematics	BS	2	2	0	3
191CS424	Computer Networks	PC	3	0	0	3
191CS422	Database Management Systems	PC	3	0	0	3
191AI421	Embedded Systems	PC	3	0	0	3
191CS423	Operating Systems	PC	3	0	0	3
191CB422	Software Design and Modeling	PC	3	0	0	3
191CS42A	**Database Management Systems Laboratory**	PC	0	0	2	1
191CS42C	**Networks Laboratory**	PC	0	0	2	1
191CS42B	**Operating Systems Laboratory**	PC	0	0	2	1
191MC46A	**Internship / Training - I**	MC	0	0	0	**
		Total	**17**	**2**	**6**	**21**

YEAR	II	SEMESTER	IV	L	T	P	C
COURSE CODE /COURSETITLE	191MA403/DISCRETEMATHEMATICS			2	2	0	3

COURSEOBJECTIVES
✓ Extendstudent'slogicalandmathematicalmaturityandabilitytodealwithabstraction. ✓ Introducemostofthebasicterminologiesusedincomputersciencecoursesandapplicationofideastosolvepractical problems. ✓ Apply thebasicconceptsofcombinatoricsandgraphtheory. ✓ Familiarizetheapplicationsofalgebraicstructures. ✓ AnalyzetheconceptsandsignificanceoflatticesandBooleanalgebra.

SYLLABUS		
UNIT-I	LOGICANDPROOFS	12
Propositionallogic–Propositionalequivalences-Predicatesandquantifiers–Nestedquantifiers–Rulesofinference.		
UNIT-II	COMBINATORICS	12
Mathematicalinduction–Stronginductionandwellordering–Thebasicsofcounting–Thepigeonholeprinciple – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Generatingfunctions–Inclusionandexclusionprincipleanditsapplications.		
UNIT-III	GRAPHS	12
Graphsandgraphmodels–Graphterminologyandspecialtypesofgraphs– Matrixrepresentationofgraphsandgraphisomorphism–Connectivity–EulerandHamiltonpaths.		
UNIT-IV	ALGEBRAICSTRUCTURES	12
Algebraicsystems–Semigroupsandmonoids-Groups–Subgroups–Homomorphism's–Normalsubgroupandcosets– Lagrange'stheorem.		
UNIT-V	LATTICESANDBOOLEANALGEBRA	12
Partialordering–Posets –Latticesasposets–Propertiesoflattices-Latticesasalgebraicsystems–Sublattices – Directproductandhomomorphism–Somespeciallattices–Booleanalgebra.		

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Use logical notation to define and reason about fundamental mathematical concepts such as sets,relations,functions,andintegersandapplyitintheirfields.
CO2	Applycountingprinciples andestimateprobabilities andalsotoanalyzealgorithmsandprograms byrecurrencerelation.
CO3	Analyzethedifferenttypesofgraphs andhenceknowabouttheapplicationofgraphtheoryintheirfield.
CO4	Analyzethealgebraicstructures andtheirapplication
CO5	EvaluateBooleanfunctions andsimplify expressionusingtheproperties ofBooleanalgebra.

TEXTBOOKS

1. Rosen,K.H.,"DiscreteMathematicsanditsApplications",7thEdition,TataMcGrawHillPub.Co.Ltd., NewDelhi,SpecialIndianEdition,2011.
2. Tremblay,J.P.andManohar.R, "DiscreteMathematicalStructureswithApplicationstoComputerScience",TataMcGrawHillPub.Co.Ltd,New Delhi,30thReprint,2011.

REFERENCES

1. Grimaldi,R.P."DiscreteandCombinatorialMathematics:AnAppliedIntroduction",4th Edition,PearsonEducationAsia,Delhi,2007.
2. Lipschutz,S.andMarkLipson.,"DiscreteMathematics",Schaum'sOutlines,TataMcGrawHillPub.Co.Ltd., NewDelhi,3rd Edition,2010.
3. Koshy,T."DiscreteMathematics withApplications",ElsevierPublications,2006.

CO- PO MAPPING

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CO1	3	3	2	2	1	-	-	-	-	-	-	1
CO2	3	3	2	2	1	-	-	-	-	-	-	1
CO3	3	3	2	2	1	-	-	-	-	-	-	1
CO4	3	3	2	2	1	-	-	-	-	-	-	1
CO5	3	3	2	2	1	-	-	-	-	-	-	1
CO	3	3	**2**	**2**	1	-	-	-	-	-	-	1

YEAR	II	SEMESTER	IV	L	T	P	C
COURSE CODE /COURSETITLE	191CS422/DATABASEMANAGEMENTSYSTEMS			3	0	0	3

COURSEOBJECTIVES

- ✓ Learnthefundamentalsofdatamodels andtorepresent adatabasesystemusingERdiagrams.
- ✓ StudySQLandrelationaldatabasedesign.
- ✓ Analyze theinternalstoragestructuresusingdifferentfileandindexingtechniqueswhichwillhelpinphysicalDBdesign.
- ✓ Applythefundamentalconceptsoftransactionprocessing-concurrencycontroltechniquesandrecoveryprocedures.
- ✓ Evaluate anintroductoryknowledgeabouttheStorageandQueryprocessingTechniques.

SYLLABUS

UNIT-I	RELATIONALDATABASES	10

Purpose of Database System – Views of data – Data Models – Database System Architecture – Introduction torelational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQLfeatures–EmbeddedSQL–Dynamic SQL.

UNIT-II	DATABASEDESIGN	8

Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping – FunctionalDependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation –Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and FifthNormalForm.

UNIT-III	TRANSACTIONS	9

Transaction Concepts – ACID Properties – Schedules – Serializability – Concurrency Control – Need forconcurrency – Locking Protocols – Two Phase Locking – Deadlock – Transaction Recovery - Save Points –IsolationLevels–SQLFacilitiesforConcurrencyandRecovery.

UNIT-IV	IMPLEMENTATIONTECHNIQUES	9

RAID – File Organization – Organization of Records in Files – Indexing and Hashing –Ordered Indices – B+ treeIndexFiles–BtreeIndexFiles–StaticHashing–DynamicHashing–QueryProcessingOverview– AlgorithmsforSELECTandJOIN operations–QueryoptimizationusingHeuristicsandCostEstimation

UNIT-V	ADVANCEDTOPICS	9

DistributedDatabases:Architecture,DataStorage,TransactionProcessing –Object-basedDatabases:ObjectDatabase Concepts, Object-Relational features, ODMG Object Model, ODL, OQL - XML Databases: XMLHierarchical Model, DTD, XML Schema, XQuery – Information Retrieval: IR Concepts, Retrieval Models,QueriesinIRsystems. Case Study on application to get discount during festival times to list the Stock Clearance.

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Remember themodernandfuturistic databaseapplicationsbasedonsizeandcomplexity.
CO2	Identify and MapERmodeltoRelationalmodeltoperformdatabasedesigneffectively.
CO3	Apply queriesusingnormalizationcriteriaandoptimizequeries.
CO4	Analyze contrast variousindexingstrategiesindifferent databasesystems.
CO5	Evaluatehowadvanceddatabasesdifferfromtraditionaldatabases.

TEXTBOOKS

1. AbrahamSilberschatz,HenryF.Korth,S.Sudharshan, - DatabaseSystemConcepts‖,SixthEdition,Tata McGrawHill,2011.
2. RamezElmasri,ShamkantB.Navathe - FundamentalsofDatabaseSystems‖,SixthEdition,PearsonEducation,2011.

REFERENCES

1. C.J.Date,A.Kannan,S.Swamynathan – "AnIntroductiontoDatabaseSystems",EighthEdition,PearsonEducation,2006.
2. RaghuRamakrishnan, "Database Management Systems", Fourth Edition, McGraw-Hill CollegePublications,2015.
3. G.K.Gupta,"DatabaseManagementSystems", TataMcGrawHill, 2011.

CO – PO MAPPING

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CO3	3	2	2	1	2	1	1	1	-	-	-	1
CO4	3	2	2	2	2	1	1	-	-	-	-	2
CO5	3	3	2	2	1	2	2	1	2	2	2	2
CO	**3**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**2**	**2**	**2**

YEAR	II	SEMESTER	IV	L	T	P	C
COURSE CODE /COURSETITLE	191CS423/OPERATINGSYSTEMS			3	0	0	3

COURSEOBJECTIVES

- ✓ To understand the basic concepts and functions of operating systems.
- ✓ Understand the structure and functions of OS.
- ✓ Learn about Processes, Threads and Scheduling algorithms.
- ✓ Understand the principles of concurrency and Deadlocks.
- ✓ To analyze various memory management schemes.
- ✓ To understand I/O management and File systems.
- ✓ To be familiar with the basics of Linux system and Mobile OS like iOS and Android.

SYLLABUS

UNIT-I	PROCESSESANDTHREADS	9

Operating system overview-objectives and functions, Evolution of Operating System -operating system structures – system calls – system programs – system structure – virtual machines. Processes: Process concept – Process scheduling – Operations on processes –Cooperating processes – Inter process communication – Communication in client-server systems-Threads: Multi-threading models – Threading issues.

UNIT-II	PROCESSSCHEDULINGANDSYNCHRONIZATION	9

CPU Scheduling: Scheduling criteria – Scheduling algorithms – Algorithm Evaluation- Process Synchronization: The critical-section problem –Synchronization hardware – Semaphores – Classic problems of synchronization – critical regions – Monitors. Deadlock: System model – Deadlock characterization –Methods for handling deadlocks – Deadlock prevention – Deadlock avoidance –Deadlock detection – Recovery from deadlock, Distributed Operating System concepts, Real time OS, Mobile OS

UNIT-III	STORAGEMANAGEMENT	9

Memory Management: Background – Swapping – Contiguous memory allocation –Paging – Segmentation – Segmentation withpaging.VirtualMemory:Background–Demandpaging–Process creation–Pagereplacement–Allocationofframes–Thrashing.

UNIT-IV	FILE SYSTEMSANDI/OSYSTEMS	9

Mass-Storage Structure: Disk scheduling – Disk management –Swap-space management-File-System Interface: File concept – Access methods – Directory structure – File system mounting – Protection. File-System Implementation: Directory implementation –Allocation methods – Free-space management – efficiency and performance – recovery. I/O Systems– I/O Hardware – Application I/O interface – kernel I/O subsystem – streams – performance

UNIT-V	ADVANCEDTOPICS	9

Linux System - Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, Input-Output Management, File System, Inter-process Communication; Mobile OS - iOS and Android - Architecture and SDK Framework, Media Layer, Services Layer, Core OS Layer, File System.

COURSEOUTCOMES Oncompletionofthecourse,students willbeableto	
CO1	Describe the Basic Concepts and functions of OS and Process.
CO2	Compare various scheduling algorithms and Understand deadlock, prevention and avoidance algorithms.
CO3	Distinguish the various memory management schemes.
CO4	Analyze the functionality of file systems.
CO5	Review the administrative tasks on Linux Servers and to Compare iOS and Android Operating Systems.

TEXTBOOKS

- ✓ Abraham Silber schatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2012.

REFERENCES

1. William Stallings, "Operating Systems – Internals and Design Principles", 7th Edition, Prentice Hall, 2011.
2. Andrew S. Tanenbaum, - "Modern Operating Systems", Second Edition, Pearson Education, 2004.
3. Achyut S. Godbole, Atul Kahate, - "Operating Systems", McGraw Hill Education, 2016.
4 Gary Nutt, - "Operating Systems", Third Edition, Pearson Education, 2004.
5. Daniel P Bovet and Marco Cesati, - "Understanding the Linux kernel", 3rd edition, O'Reilly, 2005.
6. http://nptel.ac.in/.
7. Neil Smyth, - "iPhone iOS 4 Development Essentials – Xcode", Fourth Edition, Payload media, 2011.

CO – PO MAPPING												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	1	1	-	-	-	-	-	-	1
CO2	3	3	3	2	2	-	-	-	-	-	-	1
CO3	3	3	3	2	2	-	-	-	-	-	-	1
CO4	3	3	3	3	2	-	-	-	-	-	-	1
CO5	3	3	3	3	3	2	2	2	1	1	2	2
CO	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**2**	**1**	**1**	**2**	**1**

YEAR	II	SEMESTER	IV	L	T	P	C
COURSE CODE /COURSETITLE	191CS424 / COMPUTERNETWORKS			3	0	0	3

COURSEOBJECTIVES
✓ To understand the division of network functionalities into layers. ✓ To be familiar with the components required to build different types of networks. ✓ To be exposed to the required functionality at each layer. ✓ To learn the flow control and congestion control algorithms.

SYLLABUS		
UNIT-I	FUNDAMENTALS&LINKLAYER	9
Building a network – Requirements - Layering and protocols - Internet Architecture – Network software – Performance;LinklayerServices- Framing- ErrorDetection- Flowcontrol.		
UNIT-II	MEDIAACCESS &INTERNETWORKING	9
Mediaaccess control-Ethernet (802.3) -Wireless LANs–802.11– Bluetooth-Switchingandbridging– BasicInternetworking(IP,CIDR,ARP,DHCP,ICMP).		
UNIT-III	ROUTING	9
Routing (RIP, OSPF, metrics) – Switch basics – Global Internet (Areas, BGP, IPv6), Multicast – addresses –Multicastrouting(DVMRP,PIM).		
UNIT-IV	TRANSPORTLAYER	9
Introduction – Transport Layer Protocols – Services – Port Numbers – User Datagram Protocol – TransmissionControlProtocol –SCTP.		
UNIT-V	APPLICATION LAYER	9
WWWandHTTP–FTP–Email–Telnet–SSH–DNS–SNMP.		

COURSEOUTCOMES Oncompletionofthecourse,students willbeableto	
CO1	Identify the basic layers and its functions in Computer networks and the working of various application layer protocols.
CO2	Compare the performance of a network.
CO3	Discuss the basics of how data flows from one node to another.
CO4	Analyze and design routing algorithms.
CO5	Design protocols for various functions in the network.

TEXTBOOKS

1. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A System Approach", Fifth Edition, Morgan Kaufmann Publishers, 2011.
2. Belhrouz A. Forouzan, "Data Communications and Networking", Fifth Edition TMH, 2013.

REFERENCES

1. James F. Kurose, Keith W. Ross, "Computer Networking – A Top-Down Approach Featuring the Internet", Fifth Edition, Pearson Education, 2009.
2. Nader. F. Mir, "Computer and Communications Networks", Pearson Prentice Hall Publishers, 2010.
3. William Stallings, "Data and Computer Communications", Tenth Edition, Pearson Education, 2013.
4. Ying -Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", McGraw Hill publisher, 2011.
5. Behrouz A. Forouzan, "Data Communication and Networking", Fourth Edition, Tata McGraw Hill, 2011.

CO- PO MAPPING

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CO1	3	2	2	1	1	1	-	-	-	-	1	1
CO2	3	2	2	1	1	-	-	-	-	-	1	1
CO3	3	2	2	1	1	1	-	-	-	-	1	1
CO4	3	2	2	1	-	1	-	-	-	-	1	1
CO5	3	2	2	1	-	2	1	-	1	-	1	1
CO	**3**	**2**	**2**	**1**	**1**	**1**	**1**	**-**	**1**	**-**	**1**	**1**

YEAR	II	SEMESTER	IV	L	T	P	C
COURSE CODE /COURSETITLE	191AI421/EMBEDDEDSYSTEMS			3	0	0	3

COURSEOBJECTIVES
✓ Tolearnthearchitectureandprogrammingnetworks. ✓ Tobecomefamiliarwiththeembeddedcomputingplatformdesignandanalysis. ✓ Toget thorough knowledgeininterfacingconcepts ✓ Todesignanembeddedsystemandtodevelopprograms

SYLLABUS		
UNIT-I	INTRODUCTIONTOEMBEDDEDSYSYTEM	9
Definition, Applications of ES, Embedded Hardware Units and Devices, Embedded Software, Design Metrics inES,ChallengesinESDesign.		
UNIT-II	ARCHITECTUREOF8051	9
8051MicrocontrollerHardware, Input/outputPortsandCircuits,ExternalMemory, Counter andTimers,SerialdataInput/output,InterruptsandProgramming8051.		
UNIT-III	ARM-EMBEDDEDPROCESSOR:,PROGRAMMING	9
History, Architecture, Interrupt vector, Programming the ARM, ARM Assembly language, Instruction set,ConditionalExecution, ArithmeticandLogicalCompare.Assemblyprogramming,Generalstructureofassemblylanguage, writing programs, Branch instructions, Loading constrains, load and store instructions, read only andread/writeMemory,MultipleRegisterLoadandStore.		
UNIT-IV	REALTIMEOPERATINGSYSTEMS	9
Introduction,TasksandTaskStates,TasksandData,Reentrancy,SemaphoresandSharedData, InterProcessCommunication-MessageQueues,MailboxesandPipes.		
UNIT-V	EMBEDDEDSYSTEMAPPLICATION&DEVELOPMENT	9
Case Study of Washing Machine- Automotive Application- Smart card System Application-ATM machine – Digitalcamera		

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Define theconceptofembeddedsystem,microcontroller,differentcomponentsofmicrocontrollerandtheirinteractions.
CO2	Getfamiliarizedwithprogrammingenvironmenttodevelopembeddedsolutions.
CO3	ProgramARMmicrocontrollertoperformvarioustasks.
CO4	Analyze the key concepts of embedded systems such as I/O, timers, interrupts and interaction withperipheraldevices.
CO5	Usethecasestudiesatdifferentareas.

TEXTBOOKS

1. RajKamal,"EmbeddedSystems",2ndedition,TataMcGrawHill,2009.
2. LylaBDas,"EmbeddedSystemsanIntegratedApproach",1stedition,Pearson, 2012.
3. DavidE.Simon,"AnEmbeddedSoftwarePrimer",1stedition,PearsonEducation,2008

REFERENCES

1. WayneWolf, "ComputersasComponents-principlesofEmbeddedComputersystemDesign",1stedition,Elseveir,2009.
2. Labrosse,"Embeddingsystembuildingblocks", 2rdedition, CMPPublishers,2007.
3. KennethJ.AyalaandThomson, "The8051Microcontroller", 3rdedition, ThompsonDelmar, Learning, 2008.
4. FrankVahid, TonyGivargisandJohnWiley,"EmbeddedSystemDesign,Microcontrollers",3rdedition,PearsonEducation,2008.
5. MichaelJ.Pont,"EmbeddedC", AddisonWesley, 2002

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	-	1	-	-	-	-
CO2	3	3	3	3	-	-	-	1	-	-	-	-
CO3	3	3	3	3	-	-	-	1	-	-	-	-
CO4	3	3	3	3	-	-	-	1	-	-	-	-
CO5	3	3	3	3	-	-	-	1	-	-	-	-
CO	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**

YEAR	II	SEMESTER	IV	L	T	P	C
COURSE CODE /COURSETITLE	191CB422/SOFTWAREDESIGNAND MODELING			3	0	0	3

COURSEOBJECTIVES

- ✓ To learn UML notation and symbols
- ✓ To analyze and design systems and software solutions in the object-oriented approach
- ✓ To Employ the UML notation to create effective and efficient system designs
- ✓ To learn various types of testing

SYLLABUS

UNIT-I	INTRODUCTION	9

Introduction to software design, design methods- procedural / structural and object oriented, Requirement Vs Analysis Vs Architecture Vs Design Vs Development 4+1 Architecture, case study of transferring requirement to design, UP, COMET use case based software life cycle, Introduction to UML -Basic building blocks, Reusability, Use case modeling, Use case template Case study – Transferring requirements into design using advanced tool.

UNIT-II	STATIC MODELING	9

Analysis Vs Design, Class diagram- Analysis - Object & classes finding analysis & Design- design classes, refining analysis relationships, Inheritance & polymorphism, Object diagram, Component diagram- Interfaces & components, deployment diagram, Package diagram.

UNIT-III	DYNAMIC MODELING	9

Interaction & Interaction overview diagram, sequence diagram, Timing diagram, Communication diagram, Advanced state machine diagram, Activity diagram.

UNIT-IV	ARCHITECTURE DESIGN AND PATTERNS	9

Introduction to Architectural design, overview of software architecture, Object oriented software architecture, Client server Architecture, Service oriented Architecture, Component based Architecture, Real time software Architecture. Introduction to Creational design pattern – singleton, Factory, Structural design pattern- Proxy design pattern, Adapter design pattern, Behavioral – Iterator design pattern, Observer design pattern.

UNIT-V	TESTING	9

Introduction to testing, Error, Faults, Failures, verification and validation, Whit Box Testing, Black Box Testing, Unit testing, Integration testing, GUI testing, User acceptance Validation testing, integration testing, scenario testing, performance testing. Test cases and test plan. Case studies expected for developing usability test plans and test cases.

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Define the basics of UML.
CO2	Express the software design concepts with UML diagram.
CO3	Apply the software design concepts with dynamic UML diagrams.
CO4	Categorize UML based software design into pattern based design using design patterns.
CO5	Construct the various testing methodologies.

TEXTBOOKS

1. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Pearson Education, 2005
2. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, "UML 2 Toolkit", WILEY-Dreamtech India Pvt. Ltd, 2003

REFERENCES

1. Meilir Page-Jones, "Fundamentals of Object Oriented Design in UML", Pearson Education, 2002.
2. Atul Kahate, "Object Oriented Analysis & Design", The McGraw-Hill, 2004.
3. Mark Priestley; "Practical Object-Oriented Design with UML", TATA McGrawHill, 2005.
4. Craig Larman, "Appling UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process", Pearson Education, 1997.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	1	1	-	-	-	-	-	-
CO2	3	2	2	1	1	1	1	-	-	-	-	-
CO3	3	2	2	1	1	1	1	1	-	-	-	-
CO4	3	2	2	1	1	1	1	1	1	1	1	1
CO5	3	2	2	1	1	1	1	1	1	1	1	1
CO	**3**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**

YEAR	II	SEMESTER	IV	L	T	P	C
COURSE CODE /COURSETITLE	191CS42A/ DATABASEMANAGEMENTSYSTEMSLABORATORY			0	0	2	1

COURSEOBJECTIVES

- ✓ Tolearn the data definitionsanddata manipulationcommands.
- ✓ Tounderstand theusesofnestedandjoinqueries.
- ✓ Toapplyfunctions,proceduresandproceduralextensionsofdatabases.
- ✓ To explore theusesoffrontendtool.
- ✓ Toimplementationthe typicaldatabaseapplications.

SYLLABUS

LIST OFEXPERIMENTS

1. DataDefinitionCommands,DataManipulationCommandsfor inserting, deleting,updatingandretrievingTablesandTransactionControlstatements.
2. DatabaseQuerying–Simplequeries,Nestedqueries,SubqueriesandJoins.
3. Views,Sequences,Synonyms.
4. Create a imaginary view table using views.
5. DatabaseProgramming:ImplicitandExplicit Cursors.
6. Stored ProceduresandFunctions.
7. Triggers.
8. Write a query to demonstrate any on type of triggers.
9. ExceptionHandling.
10. DatabaseDesignusingER modeling,normalizationandImplementationforanyapplication.
11. DatabaseConnectivity withFront EndTools.
12. CaseStudyusingreallifedatabaseapplications.

COURSEOUTCOMES

Oncompletionofthecourse,students willbeableto

CO1	Remember typicaldatadefinitionsandmanipulationcommands.
CO2	Identify the designapplications totestNestedandJoinQueries.
CO3	Apply simpleapplicationsthatuseViews.
CO4	Analyze applications thatrequireaFront-endTool.

CO5	Evaluate and analyze theuseofTables,Views,FunctionsandProcedures.

Requirementsforabatchof30 students

Sl. No	DescriptionofEquipment	Quantityrequired	Quantityavailable(A)	Efficiency(R-A)
1	SystemswithMySql	30	30	Nil
2	VisualStudio	30	30	Nil
3	Server	1	1	Nil

TEXTBOOKS

- ✓ AbrahamSilberschatz,HenryF.Korth,S.Sudharshan, - DatabaseSystemConcepts‖,SixthEdition,Tata McGrawHill,2011.
- ✓ Ramez Elmasri,ShamkantB.Navathe - FundamentalsofDatabaseSystems‖,SixthEdition,PearsonEducation,2011.

REFERENCES

1. C.J. Date,A. Kannan,S. Swamynathan – "AnIntroductiontoDatabaseSystems",EighthEdition,PearsonEducation,2006.
2. Raghu Ramakrishnan, "Database Management Systems", Fourth Edition, McGraw-Hill CollegePublications,2015.
3. G.K.Gupta, "DatabaseManagementSystems", TataMcGrawHill, 2011.

CO – PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	-	1	-	-	-	-	1	3
CO2	3	2	2	1	-	1	-	-	-	-	1	3
CO3	3	2	2	2	-	1	-	-	-	-	1	3
CO4	3	2	2	2	2	2	-	-	-	-	1	3
CO5	3	2	2	2	2	2	-	-	-	-	1	3
CO	**3**	**2**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**1**	**3**

YEAR	II	SEMESTER	IV	L	T	P	C
COURSE CODE /COURSETITLE	191CS42B/OPERATINGSYSTEMSLABORATORY			0	0	2	1

COURSEOBJECTIVES
• To learn Unix commands and shell programming. • To implement various CPU Scheduling Algorithms. • To implement Process Creation and Inter Process Communication. • To implement Deadlock Avoidance and Deadlock Detection Algorithms. • To implement Page Replacement Algorithms. • To implement File Organization and File Allocation Strategies.

LIST OF EXPERIMENTS	
1	Basics of UNIX commands.
2	Write programs using the following system calls of UNIX operating system fork, exec, getpid, exit, wait, close, stat, opendir, readdir.
3	Write C programs to simulate UNIX commands like cp, ls, grep, etc.
4	Shell Programming.
5	Write C programs to implement the various CPU Scheduling Algorithms.
6	Implementation of Semaphores.
7	Implementation of Shared memory and IPC.
8	Bankers Algorithm for Deadlock Avoidance.
9	Implementation of Deadlock Detection Algorithm.
10	Write C program to implement Threading & Synchronization Applications.
11	Implementation of the following Memory Allocation Methods for fixed partition, a) First Fit b) Worst Fit c) Best Fit
12	Implementation of Paging Technique of Memory Management.
13	Implementation of the following Page Replacement Algorithms, a) FIFO b) LRU c) LFU
14	Implementation of the various File Organization Techniques.
15	Implementation of the following File Allocation Strategies, a) Sequential b) Indexed c) Linked

16	Android OS / iOS Family – Case study.
17	VMware Workstation – Case study.

REQUIREMENTSFOR
ABATCHOF30STUDENTS

SI NO	DESCRIPTION OF EQUIPMENT	QUANTITY REQUIRED	QUANTITY AVAILABLE(A)	DEFICIENCY(R-A)
1	SystemswithLinuxOSand GNUComputer	30	30	Nil

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Compare the performance of various CPU Scheduling Algorithms.
CO2	Implement Deadlock avoidance and Detection Algorithms.
CO3	Demonstrate Semaphores.
CO4	Create processes and implement IPC.
CO5	Analyze the performance of the various Page Replacement Algorithms and Implement File Organization and File Allocation Strategies

TEXTBOOKS

- ✓ Abraham Silber schatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2012.

REFERENCES

1. William Stallings, "Operating Systems – Internals and Design Principles", 7th Edition, Prentice Hall, 2011.
2. Andrew S. Tanenbaum, - "Modern Operating Systems", Second Edition, Pearson Education, 2004.
3. Achyut S. Godbole, Atul Kahate, - "Operating Systems", McGraw Hill Education, 2016.
4. Gary Nutt, - "Operating Systems", Third Edition, Pearson Education, 2004.
5. Daniel P Bovet and Marco Cesati, - "Understanding the Linux kernel", 3rd edition, O'Reilly, 2005.
6. http://nptel.ac.in/.
7. Neil Smyth, - "iPhone iOS 4 Development Essentials – Xcode", Fourth Edition, Payload media, 2011.

CO – PO MAPPING												
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CO1	3	3	3	2	2	2	2	2	2	2	2	2
CO2	3	3	3	2	2	2	2	2	2	2	2	2
CO3	3	3	3	2	2	2	2	2	2	2	2	2
CO4	3	3	3	2	2	2	2	2	2	2	2	2
CO5	3	3	3	2	2	2	2	2	2	2	2	2
CO	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**

YEAR	II	SEMESTER	IV	L	T	P	C
COURSE CODE /COURSETITLE	191CS42C/NETWORKSLABORATORY			0	0	2	1

COURSEOBJECTIVES
✓ To learn network commands. ✓ To learn socket programming. ✓ To implement and analyze various network protocols. ✓ To learn and use simulation tools. ✓ To use simulation tools to analyze the performance of various network protocols.

LIST OF EXPERIMENTS	
1	Implementations of Stop and Wait Protocol and Sliding Window Protocol.
2	Study of Socket Programming and Client-Server model.
3	Write a code simulating ARP/RARP protocols.
4	Write a code simulating PING and TRACEROUTE commands
5	Create a socket for HTTP for web page upload and download.
6	Applications using TCP Sockets like: a. Echo client and Echo server b. Chat c. File Transfer
7	Simulation of DNS using UDP sockets.
8	Study of Network Simulator (NS) and Simulation of Congestion Control Algorithms using NS.
9	Study of TCP/UDP performance using simulation tool.
10	Study of Distance vector/Link State routing algorithm using NS.
11	Write a code simulating Go Back N ARQ.
12	Simulation of Error Correction Code (CRC).
13	MINI PROJECT

REQUIREMENTSFOR
ABATCHOF30STUDENTS

Sl.No	DescriptionofEquipment	Quantityrequired	Quantity available(A)	Deficiency(R-A)
1	StandaloneDesktops	30	30	Nil
2	C / C++ / Java / Python /Equivalent Compiler NetworkSimulatorlikeNS2/Glomosim /OPNEt/PacketTracer /Equivalent	30	30	Nil

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Identify various protocols using TCP and UDP.
CO2	Compare the performance of different transport layer protocols.
CO3	Use simulation tools to measure the performance of various network protocols.
CO4	Implement various routing algorithms.
CO5	Interpret error correction codes.

TEXTBOOKS

1. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A System Approach”, Fifth Edition, Morgan Kaufmann Publishers, 2011.
2. Belhrouz A. Forouzan, “Data Communications and Networking”, Fifth Edition TMH, 2013.

REFERENCES

1. James F. Kurose, Keith W. Ross, "Computer Networking – A Top-Down Approach Featuring the Internet", Fifth Edition, Pearson Education, 2009.
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3. William Stallings, "Data and Computer Communications", Tenth Edition, Pearson Education, 2013.
4. Ying -Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach",
5. McGraw Hill publisher, 2011.
6. Behrouz A. Forouzan, "Data Communication and Networking", Fourth Edition, Tata McGraw Hill, 2011.

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CO1	3	3	3	2	2	1	1	-	1	1	1	1
CO2	3	3	3	3	2	2	2	-	1	1	1	1
CO3	3	3	3	3	3	2	1	-	1	1	1	1
CO4	3	3	3	3	3	2	2	-	1	1	1	1
CO5	3	3	3	3	3	1	2	-	1	1	1	1
CO	**3**	**3**	**3**	**3**	**3**	**2**	**2**		**1**	**1**	**1**	**1**

SEMESTER-V

YEAR	III	SEMESTER	V	L	T	P	C
COURSE CODE /COURSETITLE	GRAPH THEORY AND APPLICATIONS			3	0	0	3

COURSEOBJECTIVES

- ✓ To understand fundamentals of graph theory.
- ✓ To study proof techniques related to various concepts in graphs.
- ✓ To explore modern applications of graph theory.

SYLLABUS

UNIT-I	INTRODUCTION	9

Introduction -Graph Terminologies - Types of Graphs - Sub Graph - Multi Graph, - Regular Graph, -Isomorphism -Isomorphic Graphs - Sub-graph - Euler graph - Hamiltonian Graph - Related Theorems.

UNIT-II	TREES AND CONNECTIVITY	9

Trees, Properties - Distance and Centers - Types - Rooted Tree - Tree Enumeration - Labeled Tree - Unlabeled Tree,Spanning Tree - Fundamental Circuits - Cut Sets - Properties - Fundamental Circuit and Cut-set – Connectivity and separability - Related Theorems.

UNIT-III	PLANARITY	9

Network Flows - Planar Graph - Representation – Detection - Dual Graph - Geometric and Combinatorial Dual - Related Theorems - Digraph – Properties - Euler Digraph.

UNIT-IV	MATRICES AND COLORING	9

Matrix Representation - Adjacency matrix - Incidence matrix - Circuit matrix - Cut-set matrix - Path Matrix, Properties - Related Theorems – Correlations - Graph Coloring – ChromaticPolynomial - Chromatic Partitioning - Matching – Covering - Related Theorems.

UNIT-V	GRAPH ALGORITHM AND SPANNING TREES	9

Graph Algorithms - Connectedness and Components - Spanning Tree - Fundamental Circuits - Cut Vertices, Directed Circuits - Shortest Path - Applications overview.

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Define the basic concepts of graphs and different type of graphs.
CO2	Discuss the properties, theorem and able to prove theorems.
CO3	Apply suitable graph model and algorithm for solving applications.
CO4	Analyze the matrix representation of graphs and the related theorem.
CO5	Classify various graph algorithms and their applications.

TEXTBOOKS

1. Narsingh Deo, “Graph Theory with Application to Engineering and Computer Science”, Prentice-Hall of IndiaPvt.Ltd, 2003.
2. L.R. Foulds, “Graph Theory Applications”, Springer,2016.

REFERENCES

1. Bondy, J. A. and Murty, U.S.R., "Graph Theory with Applications", North Holland Publication,2008.
2. West, D. B., “Introduction to Graph Theory”, Pearson Education, 2011.
3. John Clark, Derek Allan Holton, “A First Look at Graph Theory”, World ScientificPublishing Company, 1991.
4. Diestel, R, "Graph Theory", Springer,3rd Edition,2006.
5. Kenneth H.Rosen, "Discrete Mathematics and Its Applications", McGraw Hill, 2007.

CO- PO MAPPING

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CO2	3	3	3	3	-	-	-	1	-	-	-	-
CO3	3	3	3	3	-	-	-	1	-	-	-	-

CO4	3	3	3	3	-	-	-	1	-	-	-	-
CO5	3	3	3	3	-	-	-	1	-	-	-	-
CO	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**

YEAR	**III**	**SEMESTER**	**V**	**L**	**T**	**P**	**C**
COURSE CODE /COURSETITLE	**INTERNET PROGRAMMING**			**3**	**0**	**0**	**3**

COURSEOBJECTIVES

- ✓ To understand different Internet Technologies.
- ✓ To create the client-side Programming.
- ✓ To learn server side Programming.
- ✓ To develop php programming and Xml.
- ✓ To determine java-specific web services architecture.

SYLLABUS

UNIT-I	**WEBSITE BASICS, HTML 5, CSS 3, WEB 2.0**	**9**

Web Essentials: Clients, Servers and Communication, The Internet, Basic Internet protocols, World wide web, HTTP Request Message, HTTP Response Message, Web Clients, Web Server, HTML5: Tables, Lists, Image, HTML5 control elements, Semantic elements, Drag and Drop, Audio, Video controls, CSS3: Inline, embedded and external style sheets, Rule cascading, Inheritance, Backgrounds, Border Images , Colors , Shadows , Text, Transformations, Transitions, Animations, Examples of Canvas.

UNIT-II	**CLIENT SIDE PROGRAMMING**	**9**

Java Script: An introduction to JavaScript, JavaScript DOM Model, Date and Objects, Regular Expressions, Exception Handling, Validation, Built-in objects, Event Handling, DHTML with JavaScript, JSON introduction, Syntax, Function Files, Http Request, SQL, Arrays.

UNIT-III	**SERVER SIDE PROGRAMMING**	**9**

Servlets: Java Servlet Architecture, Servlet Life Cycle, Form GET and POST actions, Session Handling, Understanding Cookies, Installing and Configuring Apache Tomcat Web Server, DATABASE CONNECTIVITY : JDBC perspectives, JDBC program example , JSP: Understanding Java Server Pages, JSP Standard Tag Library (JSTL), Creating HTML forms by embedding JSP code, Mixing scriplets and HTML.

UNIT-IV	**PHP and XML**	**9**

An introduction to PHP: PHP, Using PHP, Variables, Program control, Built-in functions, Form Validation, Regular Expressions, File handling, Cookies, Connecting to Database. XML: Basic XML- Document Type Definition, XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation, News Feed (RSS and ATOM), XML Xlink, Xpath Axes.

UNIT-V	INTRODUCTION TO AJAX and WEB SERVICES	9

AJAX: Ajax Client Server Architecture, XML Http Request Object, Call Back Methods; Web Services: Introduction, Java web services Basics, Creating, Publishing, Testing and Describing a Web services (WSDL), Consuming a web service, Database Driven web service from an application, SOAP, AJAX ASP Example.

COURSEOUTCOMES

Oncompletionofthecourse,students willbeableto

CO1	Explain the basic web essential terms.
CO2	Discuss the creation of dynamic web page using Java Script objects.
CO3	Create server side programs using Servlets and JSP.
CO4	Construct simple web pages in PHP and represent data in XML format.
CO5	Develop AJAX, web services and various interactive web applications.

TEXTBOOKS

- ✓ Deitel and Deitel and Nieto, “Internet and World Wide Web - How to Program” , Prentice Hall, 5th Edition, 2011.

REFERENCES

1. Stephen Wynkoop and John Burke, “Running a Perfect Website”, QUE, 2nd Edition,1999.
2. Chris Bates, Web Programming , “Building Intranet Applications”, 3rd Edition, Wiley Publications, 2009.
3. Jeffrey C and Jackson, “Web Technologies A Computer Science Perspective”, Pearson Education, 2011.
4. Gopalan N.P. and Akilandeswari J, “Web Technology”, Prentice Hall of India, 2011.
5. UttamK.Roy, “Web Technologies”, Oxford University Press, 2011.

CO- PO MAPPING												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	1	-	-	-	3	3	3	-	3
CO2	3	3	3	1	-	-	-	3	3	3	-	3
CO3	3	3	3	1	-	-	-	3	3	3	-	3
CO4	3	3	3	1	-	-	-	3	3	3	-	3
CO5	3	3	3	1	-	-	-	3	3	3	-	3
CO	**3**	**3**	**3**	**1**	**-**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

YEAR	III	SEMESTER	V	L	T	P	C
COURSE CODE /COURSETITLE	DESIGN AND ANALYSIS OF ALGORITHMS			3	0	0	3

COURSEOBJECTIVES

- ✓ To learn and apply the algorithm analysis techniques.
- ✓ To understand the efficiency of alternative algorithmic solutions for the same problem.
- ✓ To apply the different algorithm design techniques.
- ✓ To analyze the limitations of Algorithmic power.

SYLLABUS

UNIT-I	INTRODUCTION	9

Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types- Fundamentals of the Analysis of Algorithmic Efficiency –Asymptotic Notations and their properties. Analysis Framework – Empirical analysis - Mathematical analysis for Recursive and Non-recursive algorithms – Visualization.

UNIT-II	BRUTE FORCE AND DIVIDE-AND-CONQUER	9

Brute Force – Computing a^n – String Matching - Closest-Pair and Convex-Hull Problems – ExhaustiveSearch - Travelling Salesman Problem - Knapsack Problem - Assignment problem.Divide and Conquer Methodology – Binary Search – Merge sort – Quick sort – Heap Sort -Multiplication of Large Integers – Closest-Pair and Convex - Hull Problems.

UNIT-III	DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE	9

Dynamic programming - Principle of optimality - Coin changing problem**,** Computing a Binomial Coefficient – Floyd's algorithm – Multi stage graph - Optimal Binary Search Trees – Knapsack Problem and Memory functions.GreedyTechnique – Container loading problem - Prim's algorithm and Kruskal's Algorithm – Knapsack problem, Optimal Merge pattern - Huffman Trees.

UNIT-IV	ITERATIVE IMPROVEMENT	9

The Simplex Method - The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs, Stable marriage problem.Branch and bound – LIFO Search and FIFO search - Assignment problem – Knapsack Problem – Travelling Salesman Problem.

UNIT-V	COPING WITH THE LIMITATIONS OF ALGORITHM POWER	9

Lower - Bound Arguments - P, NP, NP- Complete and NP Hard Problems. Backtracking – n-Queen problem - Hamiltonian Circuit Problem – Subset Sum Problem. Branch and Bound – LIFO Search and FIFO search - Assignment problem – Knapsack Problem – Travelling Salesman Problem - Approximation Algorithms for NP-Hard Problems – Travelling Salesman problem – Knapsack problem.

COURSEOUTCOMES

Oncompletionofthecourse,students willbeableto

CO1	Remember the fundamental needs of algorithms in problem solving.
CO2	Identify the Design algorithm for various computing problems.
CO3	Apply the different algorithm design techniques for a given problem.
CO4	Analyze the existing algorithm to improve efficiency.
CO5	Evaluate the time and space complexity of various algorithms.

TEXTBOOKS

1. AnanyLevitin, “Introduction to the Design and Analysis of Algorithms”, Third Edition, Pearson Education, 2012.
2. Ellis Horowitz, SartajSahni and SanguthevarRajasekaran, “Computer Algorithms/ C++”, Second Edition, Universities Press, 2007.

REFERENCES

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein,“Introduction to Algorithms”, Third Edition, PHI Learning Private Limited, 2012.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education, Reprint 2006.
3. Harsh Bhasin, “Algorithms Design and Analysis”, Oxford university press, 2015.
4. http://nptel.ac.in/.

CO – PO MAPPING												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	1	-	-	-	-	-	-	-	1
CO2	3	3	2	1	-	-	-	-	-	-	-	1
CO3	3	3	2	1	-	-	-	-	-	2	1	1
CO4	3	3	2	2	-	-	1	-	-	2	1	1
CO5	2	2	1	1	-	-	1	-	-	2	2	1
CO	**3**	**3**	**2**	**1**	**-**	**-**	**1**	**-**	**-**	**2**	**1**	**1**

YEAR	III	SEMESTER	V	L	T	P	C
COURSE CODE /COURSETITLE	INTERNET PROGRAMMING LAB			3	0	0	3

COURSEOBJECTIVES

- ✓ To be familiar with Web page design using HTML/XML and style sheets.
- ✓ To learn to create dynamic web pages using server side scripting.
- ✓ To write Client Server applications.
- ✓ To be familiar with the PHP programming.
- ✓ To be exposed to creating applications with AJAX and Spring.

LIST OF EXPERIMENTS

1	Create a web page with the following using HTML a. To embed a map in a web page b. To fix the hot spots in that map c. Show all the related information when the hot spots are clicked.
2	Create a web page with the following. a. Cascading style sheets. b. Embedded style sheets. c. Inline style sheets. Use our college information for the web pages.
3	Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.
4	Write programs in Java using Servlets: a. To invoke servlets from HTML forms b. Session tracking using hidden form fields and Session tracking for a hit count
5	Write programs in Java to create three-tier applications using servlets for conducting online examination for displaying student mark list. Assume that student information is available in a database which has been stored in a database server.
6	Install TOMCAT web server. Convert the static web pages of programs into dynamic web pages using servlets (or JSP) and cookies. Hint: Users information (user id, password, credit card number) would be stored in web.xml. Each user should have a separate Shopping Cart.
7	Redo the previous task using JSP by converting the static web pages into dynamic web pages. Create a database with user information and books information. The books catalogue should be dynamically loaded from the database.
8	Create and save an XML document at the server, which contains 10 users Information. Write a Program, which takes user Id as an input and returns the User details by taking the user information from the XML document.
9	a. Validate the form using PHP regular expression. b. PHP stores a form data into database.
10	Write a web service for finding what people think by asking 500 people‘s opinion for any consumer product.
11	Create a Spring MVC application. The application should handle form validation, file upload, session tracking.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Explain the basic web essential terms.
CO2	Discuss the creation of dynamic web page using Java Script objects.
CO3	Create server side programs using Servlets and JSP.
CO4	Construct simple web pages in PHP and represent data in XML format.
CO5	Develop AJAX, web services and various interactive web applications.

SOFTWARE REQUIRED

Dream Weaver or Equivalent, MySQL or Equivalent, Apache Server, WAMP/XAMPP.

TEXTBOOKS

- ✓ Deitel and Deitel and Nieto, "Internet and World Wide Web - How to Program" , Prentice Hall, 5th Edition, 2011.

REFERENCES

1. Stephen Wynkoop and John Burke, "Running a Perfect Website", QUE, 2nd Edition, 1999.
2. Chris Bates, Web Programming , "Building Intranet Applications", 3rd Edition, Wiley Publications, 2009.
3. Jeffrey C and Jackson, "Web Technologies A Computer Science Perspective", Pearson Education, 2011.
4. Gopalan N.P. and Akilandeswari J, "Web Technology", Prentice Hall of India, 2011.
5. UttamK.Roy, "Web Technologies", Oxford University Press, 2011.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	3	2	2	3	3	3	3	3
CO2	3	2	2	2	3	2	2	3	3	3	3	3
CO3	3	2	2	2	3	2	2	3	3	3	3	3
CO4	3	2	2	2	3	2	2	3	3	3	3	3
CO5	3	2	2	2	3	2	2	3	3	3	3	3
CO	**3**	**2**	**2**	**2**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**

YEAR	III	SEMESTER	V	L	T	P	C
COURSE CODE /COURSETITLE	PROFESSIONAL COMMUNICATION LAB			0	0	2	1

COURSEOBJECTIVES
➢ Develop their communicative competence in English with specific reference to Speaking and listening. ➢ Enhance their ability to communicate effectively in interviews. ➢ Strengthen their prospects of success in competitive examinations.

LIST OF EXPERIMENTS	
1	Letter Writing i. Formal letter ii. Informal letter
2	Report Writing i. Event report ii. Project report
3	Resume Writing
4	Non-Technical Presentation
5	Technical Presentation
6	Interview Skills
7	Group Discussion
8	Listening Comprehension
9	Reading Comprehension
10	Common Errors in English
11	Familiarize different Genres of texts.
12	Different types of speeches, debates and Model UN.

COURSE OUTCOMES	
On completion of the course, students will be able to	
CO1	Equip students with technology driven language skills required for successful undertaking of academic studies with primary emphasis on academic speaking and listening and to prepare students for competitive exams.
CO2	Identify different genres of reading and writing, and be able to reflect and respond critically on formal communication such as letters, reports and memos.
CO3	Learn to understand the role of multiple intelligences and incorporate them in communication in a diverse team.

CO- PO MAPPING												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	-	-	-	-	-	-	-	3	3	2	2
CO2	3								3	3	2	2
CO3	3	-	-	-	-	-	-	-	3	3	2	2
CO	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**2**	**2**

YEAR	III	SEMESTER	V	L	T	P	C
COURSE CODE /COURSETITLE	DESIGN AND ANALYSIS OF ALGORITHMS LAB			0	0	2	1

COURSEOBJECTIVES

- ✓ To learn the problems using divide and conquer strategy.
- ✓ To understand the problems using backtracking strategy.
- ✓ To implement problems using greedy and dynamic programming techniques.
- ✓ To perform Optimal Binary Search.

LIST OF EXPERIMENTS

1. Write a java program to implement Bubble sort algorithm for sorting a list of integers in ascending order
2. Write a java program to implement Quick sort algorithm for sorting a list of integers in ascending order
3. Write a java program to implement Merge sort algorithm for sorting a list of integers in ascending order.
4. Write a java program to implement the dfs algorithm for a graph.
5. Write a java program to implement the bfs algorithm for a graph.
6. Write a java programs to implement backtracking algorithm for the N-queens problem.
7. Write a java program to implement the backtracking algorithm for the sum of subsets problem.
8. Write a java program to implement the backtracking algorithm for the Hamiltonian Circuits problem.
9. Write a java program to implement greedy algorithm for job sequencing with deadlines.
10. Write a java program to implement Dijkstra's algorithm for the Single source shortest path problem.
11. Write a java program that implements Prim's algorithm to generate minimum cost spanning tree.
12. Write a java program that implements Kruskal's algorithm to generate minimum cost spanning tree
13. Write a java program to implement Floyd's algorithm for all the pair shortest path problem.
14. Write a java program to implement Dynamic Programming algorithm for the 0/1 Knapsack problem.
15. Write a java program to implement Dynamic Programming algorithm for the Optimal Binary Search Tree Problem.
16. Write a java program to implement Greedy algorithm for theKnapsack problem.

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Remember how to analyze a problem and design the solution for the problem.
CO2	Identify design and implement efficient algorithms for a specified application.
CO3	Apply Strengthen the ability to identify and apply the suitable algorithm for the given real-world problem.
CO4	Evaluate the design algorithm for various computing problems.

TEXTBOOKS

1. Levitin A, "Introduction to the Design and Analysis of Algorithms", Pearson Education, 2008.
2. Goodrich M.T.R Tomassia, "Algorithm Design foundations Analysis and Internet Examples", John Wileyn and Sons, 2006.
3. Base Sara, Allen Van Gelder, "Computer Algorithms Introduction to Design and Analysis", Pearson, 3rd Edition, 1999.

REFERENCES

1. http://www.personal.kent.edu/~rmuhamma/Algorithms/algorithm.html
2. http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms
3. http://www.facweb.iitkgp.ernet.in/~sourav/daa.html

CO – PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
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CO2	3	3	2	2	-	-	-	1	-	-	-	1
CO3	3	2	2	1	-	-	-	1	-	-	-	1
CO4	3	3	2	2	-	-	-	1	-	-	-	1
CO	**3**	**3**	**2**	**2**	-	-	-	1	-	-	-	1

SEMESTER- VI

YEAR	III	SEMESTER	VI	L	T	P	C
COURSE CODE /COURSETITLE	COMPUTER GRAPHICS AND MULTIMEDIA			3	0	0	3

COURSEOBJECTIVES

- ✓ To develop an understanding and awareness how issues such as content, information architecture, otion, sound, design, and technology merge to form effective and compelling interactive experiences for a wide range of audiences and end users.
- ✓ To become familiar with various software programs used in the creation and implementation of multi- media.
- ✓ To appreciate the importance of technical ability and creativity within design practice.
- ✓ To gain knowledge about graphics hardware devices and software used.
- ✓ To understand the two-dimensional graphics and their transformations.
- ✓ To understand the three-dimensional graphics and their transformations.
- ✓ To appreciate illumination and color models.
- ✓ To become familiar with understand clipping techniques.
- ✓ To become familiar with Blender Graphics.

SYLLABUS

UNIT-I	ILLUMINATION AND COLOR MODELS	9

Light sources, Basic illumination models, Halftone patterns and dithering techniques; Properties of light, Standard primaries and chromaticity diagram; Intuitive colour concepts, RGB colour model, YIQ colour model, CMY colour model, HSV colour model, HLS colour model; Colour selection. Output primitives, points and lines, line drawing algorithms, loading the frame buffer, line function; circle and ellipse generating algorithms; Pixel addressing and object geometry, filled area primitives.

APPLICATION: Color the objects using filling algorithm and inbuilt algorithm.

UNIT-II	TWO-DIMENSIONAL GRAPHICS	9

Two dimensional geometric transformations, Matrix representations and homogeneous coordinates, composite transformations; Two - dimensional viewing, viewing pipeline, viewing coordinate reference frame; window-to-viewport coordinate transformation, Two - dimensional viewing functions; clipping operations – point, line, and polygon clipping algorithms.

APPLICATION: Implementation of Liang Barsky line clipping

UNIT-III	THREE-DIMENSIONAL GRAPHICS	9

Three dimensional concepts; Three - dimensional object representations, Polygon surfaces, Polygon tables, Plane equations, Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects; Spline representations, Bezier curves and surfaces, B-Spline curves and surfaces. TRANSFORMATION AND VIEWING: Three dimensional geometric and modeling transformations, Translation, Rotation, Scaling, composite transformations; Three - dimensional viewing, viewing pipeline, viewing coordinates, Projections, Clipping; Visible surface detection methods.

CASE STUDY: Create 3-D scenes in a attractive way using transformation and viewing.

UNIT-IV	MULTIMEDIA SYSTEM DESIGN & MULTIMEDIA FILE HANDLING	9

Multimedia basics, Multimedia applications, Multimedia system architecture, evolving technologies for multimedia, Defining objects for multimedia systems, Multimedia data interface standards, Multimedia databases. Compression and decompression, Data and file format standards, Multimedia I/O technologies, Digital voice and audio, Video image and animation, Full motion video, Storage and retrieval technologies.

UNIT-V	HYPERMEDIA	9

Multimedia authoring and user interface, Hypermedia messaging, Mobile messaging, Hypermedia message component, Creating hypermedia message,**.** Integrated multimedia message standards, Integrated document management, Distributed multimedia systems, Animation: Uses of Animation, Principles of Animation, Computer based animation, 3D Animation, Animation file formats, Animation softwareCASE STUDY: BLENDER GRAPHICS Blender Fundamentals, Drawing Basic.

COURSEOUTCOMES

Oncompletionofthecourse,students willbeableto

CO1	Interpret Illumination and color models.
CO2	Apply two dimensional transformations and two - dimensional graphics.
CO3	Design three - dimensional graphics and three - dimensional transformations.
CO4	Implement clipping techniques to graphics.
CO5	Outline types of Multimedia File Format and Design Basic 3d Scenes using Blender.

TEXTBOOKS

1. Donald Hearn and Pauline Baker M, “Computer Graphics", Prentice Hall, New Delhi, 2007. (UNIT I – III)
2. Andleigh, P. K and KiranThakrar, “Multimedia Systems and Design‖, PHI, 2003. (UNIT IV,V).

REFERENCES

1. Judith Jeffcoate, "Multimedia in practice: Technology and Applications", PHI, 1998.
2. Foley, Vandam, Feiner and Hughes, "Computer Graphics: Principles and Practice", 2nd Edition, PearsonEducation, 2003.
3. Jeffrey McConnell, "Computer Graphics: Theory into Practice", Jones and Bartlett Publishers,2006.
4. Hill F S Jr., "Computer Graphics", Maxwell Macmillan , 1990.
5. Peter Shirley, Michael Ashikhmin, Michael Gleicher, Stephen R Marschner, Erik Reinhard, KelvinSung, and AK Peters, "Fundamentals of Computer Graphics", CRC Press, 2010.
6. William M. Newman and Robert F.Sproull, "Principles of Interactive Computer Graphics", McGraw Hill 1978. https://www.blender.org/support/tutorials/.

CO – PO MAPPING

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CO4	3	3	3	1	1	-	-	-	1	1	-	1
CO5	3	3	3	2	2	-	-	-	1	-	-	1
CO	**3**	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**1**	**1**	**-**	**1**

YEAR	III	SEMESTER	VI	L	T	P	C
COURSE CODE /COURSETITLE	MACHINE LEARNING TECHNIQUES			3	0	0	3

COURSE OBJECTIVES

- ✓ To understand the need for machine learning for various problem solving.
- ✓ To study the various supervised, semi-supervised and unsupervised learning algorithm in machine learning.
- ✓ To understand the latent trends in machine learning.
- ✓ To design appropriate machine learning algorithms for problem solving.

SYLLABUS

UNIT-I	INTRODUCTION	9

Introduction to Artificial Intelligence-Application of AI-Machine Learning-Machine Learning Life Cycle-applications-Types of machine learning, Learning Problems, Perspectives and Issues, Concept Learning, Version Spaces and Candidate Eliminations, Inductive bias, Decision Tree learning, Representation, Algorithm, Heuristic Space Search.

UNIT-II	NEURAL NETWORKS AND GENETIC ALGORITHMS	9

Basics of Neural Networks-Neural network representation, History and cognitive basis of neural computation, Neural Network Representation, Problems, Perceptrons, Multilayer Networks and Back Propagation Algorithms, Advanced Topics, Genetic Algorithms, Hypothesis Space Search, Genetic Programming, Models of Evaluation and Learning.

UNIT-III	BAYESIAN AND COMPUTATIONAL LEARNING	9

Bayes Theorem, Concept Learning, Maximum Likelihood, Minimum Description Length Principle, Bayes Optimal Classifier, Gibbs Algorithm, Naïve Bayes Classifier, Bayesian Belief Network, EM Algorithm, Probability Learning, Sample Complexity, Finite and Infinite Hypothesis Spaces, Mistake Bound Model.

UNIT-IV	INSTANT BASED LEARNING	9

K- Nearest Neighbor Learning, Locally weighted Regression, Radial Basis Functions, Case Based Learning.

UNIT-V	ADVANCED LEARNING	9

Learning Sets of Rules, Sequential Covering Algorithm, Learning Rule Set, First Order Rules, Sets of First Order Rules, Induction on Inverted Deduction, Inverting Resolution, Analytical Learning, Perfect Domain Theories, Explanation Base Learning, FOCL Algorithm, Reinforcement Learning, Task, Q-Learning, Temporal Difference Learning, Deep Neural Networks.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Recall the learning techniques with this basic knowledge.
CO2	Define effectively neural network and genetic algorithm for appropriate applications.
CO3	Apply Bayesian techniques and derive effectively learning rules.
CO4	Analyze the different machine learning techniques.
CO5	Differentiate reinforcement and analytical learning techniques.

TEXT BOOKS

- ✓ Tom M. Mitchell, "Machine Learning", McGraw-Hill Education (India) Private Limited, 2013.

REFERENCES

1. EthemAlpaydin, "Introduction to Machine Learning (Adaptive Computation and Machine Learning)", The MIT Press 2004.
2. Stephen Marsland, "Machine Learning: An Algorithmic Perspective", CRC Press, 2009.

CO- PO MAPPING

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CO3	3	2	2	1	-	-	-	-	1	-	-	1
CO4	3	2	2	1	-	-	-	-	1	-	-	1
CO5	3	2	2	1	1	-	-	-	1	-	-	1
CO	**3**	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**1**	**-**	**-**	**1**

YEAR	III	SEMESTER	VI	L	T	P	C
COURSE CODE /COURSETITLE	BIG DATA ANALYTICS			3	0	0	3

COURSE OBJECTIVES

- ✓ To know the fundamental concepts of big data and analytics.
- ✓ To explore tools and practices for working with big data.
- ✓ To learn about stream computing.
- ✓ To know about the research that requires the integration of large amounts of data.

SYLLABUS

UNIT-I	INTRODUCTION TO BIG DATA	9

Evolution of Big data, Best Practices for Big data Analytics, Big data characteristics, Validating, The Promotion of the Value of Big Data, Big Data Use Cases, Characteristics of Big Data Applications, Perception and Quantification of Value, Understanding Big Data Storage, A General Overview of High-Performance Architecture, HDFS, MapReduce and YARN, Map Reduce Programming Model.

UNIT-II	CLUSTERING AND CLASSIFICATION	9

Advanced Analytical Theory and Methods: Overview of Clustering, K-means, Use Cases, Overview of the Method, Determining the Number of Clusters, Diagnostics, Reasons to Choose and Cautions, Classification: Decision Trees, Overview of a Decision Tree, The General Algorithm, Decision Tree Algorithms, Evaluating a Decision Tree, Decision Trees in R, Naive Bayes, Bayes‘ Theorem, Naive Bayes Classifier.

UNIT-III	ASSOCIATION AND RECOMMENDATION SYSTEM	9

Advanced Analytical Theory and Methods: Association Rules, Overview, Apriori Algorithm, Evaluation of Candidate Rules, Applications of Association Rules, Finding Association& finding similarity, Recommendation System: Collaborative Recommendation, Content Based Recommendation, Knowledge Based Recommendation, Hybrid Recommendation Approaches.

UNIT-IV	STREAM MEMORY	9

Introduction to Streams Concepts, Stream Data Model and Architecture, Stream Computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating moments, Counting oneness in a Window, Decaying Window, Real time Analytics Platform (RTAP) applications, Case Studies, Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics.

UNIT-V	NOSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATION	9

NoSQL Databases : Schema-less Models: Increasing Flexibility for Data Manipulation, Key Value Stores, Document Stores, Tabular Stores, Object Data Stores, Graph Databases Hive, Sharding, Fundamentals of HBase and ZooKeeper - IBM InfoSphere BigInsights and Streams,Analyzing big data with twitter, Big data for E-Commerce Big data for blogs, Review of Basic Data Analytic Methods using R.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Describe the big data tools and its analysis techniques.
CO2	Identify the data by utilizing clustering and classification algorithms.
CO3	Apply different mining algorithms and recommendation systems for large volumes of data.
CO4	Analyze the data streaming methods
CO5	Investigate NoSQL databases and management

TEXT BOOKS

1. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
2. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/El sevier Publishers, 2013.

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1. EMC Education Services, “Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015.
2. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers, 2015.
3. DietmarJannach and Markus Zanker, "Recommender Systems: An Introduction", Cambridge University Press, 2010.
4. Kim H. Pries and Robert Dunnigan, "Big Data Analytics: A Practical Guide for Managers " CRC Press, 2015.
5. Jimmy Lin and Chris Dyer, "Data-Intensive Text Processing with MapReduce", Synthesis Lectures on Human Language Technologies, Vol. 3, No. 1, Pages 1-177, Morgan Claypool publishers, 2010.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	1	1	1	-	-	-	-
CO2	3	3	2	2	2	1	1	1	-	-	-	1
CO3	3	3	2	2	1	1	1	1	1	-	-	1

CO4	3	2	2	2	2	1	1	1	1	1	1	1
CO5	3	2	2	2	2	1	1	1	1	1	1	1
CO	**3**	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**

YEAR	**III**	**SEMESTER**	**VI**	**L**	**T**	**P**	**C**
COURSE CODE /COURSETITLE	**COMPUTER GRAPHICS AND MULTIMEDIA LABORATORY**			**0**	**0**	**2**	**3**

COURSEOBJECTIVES

- ✓ To develop an understanding and awareness how issues such as content, information architecture, motion, sound, design, and technology merge to form effective and compelling interactive experiences for a wide range of audiences and end users.
- ✓ To become familiar with various software programs used in the creation and implementation of multi- media.
- ✓ To appreciate the importance of technical ability and creativity within design practice.
- ✓ To understand the two-dimensional graphics and their transformations and clipping techniques.
- ✓ To understand the three-dimensional graphics and their transformations.

LIST OF EXPERIMENT

1.Implementation of line generation using slope's method
2 Implementation of Circle generation using Mid-Point method and Bresenham's method.
3 Implementation of ellipse generation using Mid-Point Method.
4 Implementation of Polygon filling using flood fill, boundary fill, and scan line algorithms.
5 Implementation of 2D transformation:
Translation, Scaling, Rotation, Mirror reflection and Shearing
6 Implementation of Line Clipping using Cohen- Sutherland Algorithm and Bisection method.
7 Implementation of Polygon Clipping using Sutherland- Hodgeman Algorithm.
8. Implementation of 3-D Transformations (Translation, Scaling, Rotation, Mirror reflection and Shearing)
9. Implementation of simple animations using transformations.
10. Compression Algorithms - To implement text and image compression algorithms.
11. Image Editing and Manipulation - Basic Operations on image using any image editing software, Creating gif animated images, Image optimization.

MINI PROJECT:

Write a Program to draw animation using increasing circles filled with different colors and patterns.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Identify how to generate line, circle and ellipse

CO2	Apply 2D object and various transformation techniques
CO3	Outline various 3D Transformation techniques using OpenGL.
CO4	Implementing multimedia compression techniques and applications.

SOFTWARE REQUIRED

- ✓ Turbo C/C++ compiler that supports graphics.h. package.
- ✓ Special DOSBoxed installer for Turbo C++ compiler.

Download from following link:
http://www.megaleecher.net/Download_Turbo_For_Windows.

CO – PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	3	3	2	2	-	-	-	2	2	-	1
CO 2	3	3	3	2	2	2	-	-	2	-	2	1
CO 3	3	3	3	2	2	-	-	-	2	2	2	1
CO 4	3	3	3	2	2	2	-	-	2	-	-	1
CO	**3**	**3**	**3**	**2**	**2**	**2**	**-**	**-**	**2**	**2**	**2**	**1**

YEAR	III	SEMESTER	VI	L	T	P	C
COURSE CODE /COURSETITLE	DATA ANALYTICS LAB			3	0	0	3

COURSEOBJECTIVES
✓ To implement Map Reduce programs for processing big data ✓ To realize storage of big data using H base, Mongo DB ✓ To analyze big data using linear models ✓ To analyze big data using machine learning techniques such as SVM / Decision tree classification and clustering

LIST OF EXPERIMENTS

Hadoop

1. Install, configure and run Hadoop and HDFS.
2. Implement word count / frequency programs using MapReduce.
3. Implement an MR program that processes a weather dataset.

R

4. Implement Linear and logistic Regression.
5. Implement SVM / Decision tree classification techniques.
6. Implement clustering techniques.
7. Visualize data using any plotting framework.
8. Implement an application that stores big data in Hbase / MongoDB / Pig using Hadoop / R.

SOFTWARE REQUIRED

- Hadoop
- YARN
- R Package
- Hbase
- MongoDB

COURSE OUTCOMES On completion of the course, students will be able to	
CO1	Express big data using Hadoop framework.
CO2	Apply linear and logistic regression models.
CO3	Perform data analysis with machine learning methods.
CO4	Analyze clustering methods.
CO5	Interpret graphical data analysis.

CO- PO MAPPING												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	2	1	-	-	-	-	-	-	-
CO2	3	3	2	2	1	1	-	-	-	-	-	1
CO3	3	3	2	2	1	1	1	-	-	-	-	1
CO4	3	3	2	2	1	1	1	1	1	1	1	1
CO5	3	3	2	2	1	1	1	1	1	1	1	1
CO	**3**	**3**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**

SEMESTER- VII

YEAR	IV	SEMESTER	VII	L	T	P	C
COURSE CODE /COURSETITLE	**Artificial Neural Networks and Deep Learning**			3	0	0	3

COURSEOBJECTIVES
✓ To learn the basic concepts of machine learning. ✓ Discuss with the various algorithm techniques used in neural networks. ✓ To analyze the strategies used in deep learning. ✓ To interpret the concepts of CNN and RNN. ✓ To appraise the tools leading to the advancement of deep learning.

SYLLABUS		
UNIT-I	**MACHINE LEARNING**	**9**
Machine Learning - Examples of machine learning applications - Types of machine learning – Supervised Learning: Classification - Decision Trees, Neural Networks – Unsupervised Learning: Clustering- Clustering Methods-Graph Clustering.		
UNIT-II	**FUNDAMENTALS OF NEURAL NETWORKS**	**9**
Basics of Neural Networks- Neural network representation-History and cognitive basis of neural computation-Perceptrons- Perceptron Learning Algorithm- Multilayer Perceptrons (MLPs)- Representation Power of MLPs-Back Propagation.		
UNIT-III	**DEEP LEARNING FUNDAMENTALS AND STRATEGIES**	**9**
Introduction to deep learning-History of Deep Learning- Perspectives and issues in deep learning – Deep Neural Networks - Unsupervised deep learning - Deep reinforcement learning - Deep learning strategies.		
UNIT-IV	**CNN and RNN**	**9**
Foundations on CNN, Convolutional Neural Networks (CNNs): LeNet, AlexNet, ZFNet, VGGNet, GoogLeNet, ResNet- -Recurrent Neural Networks-Optimization in deep learning: Gradient Descent (GD) - Momentum Based GD.		
UNIT-V	**DEEP LEARNING TOOLS**	**9**

CUDA ToolKit : Introduction, Programming Model, Programming interface, Performance Guidelines- NVIDIA-NVIDIA Architecture- Case Study : Tensor Flow, Caffe, Theano, Torch.

TEXTBOOKS

1. Ian Goodfellow and Yoshua Bengio and Aaron Courville,"Deep Learning" An MIT Press book, 2016.
2. Ethern Alpaydin, "Introduction to Machine Learning", MIT Press book, 2014.
3. Li Deng and Ding Yu, "Deep Learning Methods and Applications" Now publishers, 2014.

REFERENCES

1. Tom M Mitchell, "Machine‖ Learning" FirstEdition,McGrawHill‖ Education, 2013.
2. Yegna Narayana. B, "ArtificialNeural Networks" IPHI Learning Pvt. Ltd, 2009.
3. Satish Kumar, Neural Networks: A Classroom Approach",Tata McGraw-Hill Education, 2004.
4. ChristopherBishop, "Pattern Recognition andMachineLearning" 2e,Springer,2006.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Discuss the architectural concepts, key technologies, strengths and limitations of cloud computing.
CO2	Apply the concept of virtualization in cloud technology.
CO3	Analyze the ability to understand and use the architecture of compute and storage cloud, service and delivery models.
CO4	Construct appropriate resource management and Security mechanism to build a cloud environment.
CO5	Develop operation and economic models of various trending cloud platforms.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	-	-	-	-	-	-	-	1
CO2	3	3	3	2	-	-	-	-	-	-	-	1

CO3	3	3	3	2	-	-	-	-	-	-	-	1
CO4	3	3	3	-	2	-	-	-	-	-	-	2
CO5	3	3	3	1	3	-	-	-	-	-	-	2
CO	**3**	**3**	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**

YEAR	**IV**	**SEMESTER**	**VII**	**L**	**T**	**P**	**C**
COURSE CODE /COURSETITLE	**191CS722/ CLOUD COMPUTING**			**3**	**0**	**0**	**3**

COURSE OBJECTIVES

- ✓ To explain the concept of cloud computing.
- ✓ To appraise the evolution of cloud from the existing technologies.
- ✓ To apply knowledge on the various issues in cloud computing.
- ✓ To organize the various advances leading to security concerns.
- ✓ To design an emergence of cloud as the next generation computing paradigm.

SYLLABUS

UNIT-I	**INTRODUCTION**	**8**

Introduction to Cloud Computing, Definition of Cloud, Evolution of Cloud Computing -Fundamental Cloud Architectures - Advanced Cloud Architectures - Specialized Cloud Architecture- Underlying Principles of Parallel and Distributed Computing , Cloud Characteristics - Elasticity in Cloud - On demand provisioning

UNIT-II	**CLOUD ENABLING TECHNOLOGIES**	**10**

Service Oriented Architecture , REST and Systems of Systems , Web Services, Publish Subscribe Model , Basics of Virtualization , Types of Virtualization, Implementation Levels of Virtualization, Virtualization Structures, Tools and Mechanisms , Virtualization of CPU, Memory, I/O Devices, Virtualization Support and Disaster Recovery -Mobile Platform Virtualization.

UNIT-III	**CLOUD ARCHITECTURE, SERVICES AND STORAGE**	**8**

Layered Cloud Architecture Design , NIST Cloud Computing Reference Architecture , Public, Private and Hybrid Clouds , laaS, PaaS, SaaS, Architectural Design Challenges , Cloud Storage , Storage-as-a-Service, Advantages of Cloud Storage, Cloud Storage Providers – S3- A Case Study: The Grep - TheWeb Application.

UNIT-IV	**RESOURCE MANAGEMENT AND SECURITY IN CLOUD**	**10**

Inter Cloud Resource Management , Resource Provisioning and Resource Provisioning Methods , Global Exchange of Cloud Resources, -Scheduling Algorithms for Computing Clouds - Resource Management and Dynamic Application Scaling - Security Overview , Cloud Security Challenges, Software-as-a-Service Security, Security Governance, Virtual Machine Security, IAM, Security Standards.

UNIT-V	CLOUD TECHNOLOGIES AND ADVANCEMENTS	8

Hadoop,MapReduce, Virtual Box,Google App Engine,Programming Environment for Google App Engine,Amazon AWS - Cloud Software Environments -Eucalyptus, Open Nebula, OpenStack, Aneka, CloudSim, Federation in the Cloud,Four Levels of Federation, Federated Services and Applications, Future of Federation.

TEXT BOOKS

1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. Rittinghouse, John W., and James F. Ransome, “Cloud Computing: Implementation, Management and security”, CRC Press, 2017.

REFERENCES

1. RajkumarBuyya, Christian Vecchiola, S. ThamaraiSelvi, “Mastering Cloud Computing”, Tata Mcgraw Hill, 2013.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing - A Practical Approach”, Tata Mcgraw Hill, 2009.
3. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice)”, O'Reilly, 2009.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Discuss the architectural concepts, key technologies, strengths and limitations of cloud computing.
CO2	Apply the concept of virtualization in cloud technology.
CO3	Analyze the ability to understand and use the architecture of compute and storage cloud, service and delivery models.
CO4	Construct appropriate resource management and Security mechanism to build a cloud environment .
CO5	Develop operation and economic models of various trending cloud platforms.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1	3	2	2	1	-	-	-	-	-	-	-	1
CO2	3	2	2	1	-	-	-	-	-	-	-	1
CO3	3	2	2	2	1	-	-	-	-	-	-	1
CO4	3	2	2	1	-	-	-	-	-	-	-	1
CO5	3	2	2	1	1	-	-	-	-	-	-	1
CO	**3**	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

YEAR	**IV**	**SEMESTER**	**VII**	**L**	**T**	**P**	**C**
COURSE CODE /COURSETITLE	**ARTIFICIAL NEURAL NETWORK AND DEEP LEARNING LAB**			**3**	**0**	**0**	**3**

COURSEOBJECTIVES

- ✓ To learn and analyze the tool used in neural networks.
- ✓ Apply the structure of a neuron in artificial.
- ✓ Analyze learning classifiers in network (Supervised and Unsupervised).
- ✓ Analyze the concepts of learning rules using CNN and RNN.

LIST OF EXPERIMENTS :

1. Write a program to implement Perceptron.
2. Write a program to implement AND OR gates using Perceptron.
3. Implement Crab Classification using pattern net.
4. Write a program to implement Wine Classification using Back propagation.
5. Write a MatLab Script containing four functions Addition, Subtraction, Multiply and Divide functions.
6. Write a program to implement classification of linearly separable Data with a perceptron.
7. Write a program in MatLab for creating a Back propagation Feed-forward neural network.
8. Study of Long Short Term Memory for Time Series Prediction.
9. Study of Convolutional Neural Network and Recurrent Neural Network.
10. Study of ImageNet, GoogleNet, ResNet convolutional Neural Networks.
11. Study of the use of Long Short Term Memory / Gated Recurrent Units to predict the stock prices based on historic data.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Understand the characteristics and types of artificial neural network and remember working of biological Neuron and Artificial Neural Network.

CO2	Use learning algorithms on perceptron and apply back propagation learning on Neural Network.
CO3	Apply Feedback NN and plot a Boltzmann machine and associative memory on various applications.
CO4	Analyze different types of auto encoders with dimensionality reduction and regularization.
CO5	Design Convolutional Neural Network and classification using Convolutional Neural Network.

SOFTWARE REQUIRED

- ✓ Keras
- ✓ Convent JS
- ✓ Gensim
- ✓ Theano
- ✓ Mat lab

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Understand the characteristics and types of artificial neural network and remember working of biological Neuron and Artificial Neural Network.
CO2	Use learning algorithms on perceptron and apply back propagation learning on Neural Network.
CO3	Apply Feedback NN and plot a Boltzmann machine and associative memory on various applications.
CO4	Analyze different types of auto encoders with dimensionality reduction and regularization.
CO5	Design Convolutional Neural Network and classification using Convolutional Neural Network.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	-	-	-	-	-	-	-	2
CO2	3	3	3	2	-	-	-	-	-	-	-	2
CO3	3	3	3	2	-	-	-	-	-	-	-	2
CO4	3	3	3	2	-	-	-	-	-	-	-	2
CO5	3	3	3	1	3	-	-	-	-	-	-	2

CO	**3**	**3**	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**

YEAR	**IV**	**SEMESTER**	**VII**	**L**	**T**	**P**	**C**
COURSE CODE /COURSETITLE	**CLOUD COMPUTING LABORATORY**			**0**	**0**	**2**	**1**

COURSEOBJECTIVES
✓ To develop web applications in cloud. ✓ To design and development process involved in creating a cloud based Application. ✓ To implement and use parallel programming using Hadoop.

LIST OF EXPERIMENTS	
1	Install Virtualbox/VMware Workstation with different flavours of Linux or Windows OS on top of windows 7 or 8.
2	Install a C compiler in the virtual machine created using virtual box and execute Simple Programs.
3	Install Google App Engine. Create hello world app and other simple web applications using python/java.
4	Use GAE launcher to launch the web applications.
5	Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6	Find a procedure to transfer the files from one virtual machine to another virtual machine.
7	Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)

8	Install Hadoop single node cluster and run simple applications like wordcount
9	Use gcc to compile c-programs. Split the programs to different modules and create an application using make command
10	Use version control systems command to clone, commit, push, fetch, pull, checkout, reset, and delete repositories

COURSE OUTCOMES

On completion of the course, students will be able to

CO1	Install various virtualization tools such as Virtual Box, VMware workstation.
CO2	Use Cloud SIM to run various schedulers.
CO3	Design a web application in a IaaS environment.
CO4	Develop a generic cloud environment which can be used as a private cloud.
CO5	Implement version control systems with various command repositories.

SOFTWARE REQUIRED

- ✓ A PC/Laptop with Oracle Virtual box 6.1.6
- ✓ VMware Workstation
- ✓ Google app engine
- ✓ Oracle Hadoop 3.2.1

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	1	-	-	-	-	-	-	-
CO2	2	1	1	1	1	-	-	-	-	-	-	1

CO3	2	1	1	1	1	1	-	-	1	-	-	1
CO4	3	2	2	1	1	1	--	-	-	-	-	-
CO5	2	1	1	1	1	1	1	-	-	-	-	-
CO	**3**	**1**	**1**	**1**	**1**	**1**	**1**	**-**	**1**	**-**	**-**	**1**

SEMESTER- VIII

YEAR	IV	SEMESTER	VIII	L	T	P	C
COURSE CODE /COURSETITLE	BLOCKCHAIN TECHNOLOGY			9	0	0	9

COURSEOBJECTIVES
✓ To understand the basic concepts of blockchain. ✓ To learn about blockchain in Cryptography. ✓ To study about Bitcoin. ✓ To build smart contracts and Etherum. ✓ To develop an application using blockchain development tools and hyperledger tools.

SYLLABUS		
UNIT-I	INTRODUCTION TO BLOCKCHAIN	9
Blockchain: The growth of blockchain technology - Distributed systems - The history of blockchain and Bitcoin - Features of a blockchain - Types of blockchain, Consensus: Consensus mechanism - Types of consensus mechanisms - Consensus in blockchain. Decentralization: Decentralization using blockchain - Methods of decentralization - Routes to decentralization- Blockchain and full ecosystem decentralization - Smart contracts - Decentralized Organizations- Platforms for decentralization.		
UNIT-II	BLOCKCHAIN IN CRYPTOGRAPHY	9

Introduction - Working with the Open SSL command line – Introduction: Mathematics, Cryptography, Confidentiality, Integrity, Authentication, Non-repudiation, Accountability - Cryptographic primitives: Symmetric cryptography, Data Encryption Standard, Advanced Encryption Standard - Public Key Cryptography - Asymmetric cryptography -Public and private keys - RSA - Encryption and decryption using RSA Discrete algorithm problem in ECC - Encryption and decryption - ECC using OpenSSL - Hash functions -Message Digest- Merkle trees -Patricia trees - Financial markets and trading.

UNIT-III	BITCOIN	9

Introduction: Bitcoin - Private keys in Bitcoin, Transactions: The transaction life cycle - The transaction data structure - Types of transactions - Transaction malleabilityBlockchain Mining, Tasks of the miners - Mining rewards Proof of Work (PoW) - The mining algorithm - The hash rate - Mining systems - Mining pools. Bitcoin Network and Payments: The Bitcoin network – Wallets - Bitcoin payments - Innovation in Bitcoin. Bitcoin Clients and APIs: Bitcoin installation. Alternative Coins: Alternatives to Proof of Work -Proof of Stake (PoS) - Proof of Deposit (PoD).

UNIT-IV	SMART CONTRACTS AND ETHEREUM	9

Smart Contracts: Introduction - Ricardian contracts - Deploying smart contracts on a blockchain. Ethereum: Introduction - The Ethereum network - Components of the Ethereum ecosystem - Transactions and messages - Ether cryptocurrency / tokens (ETC and ETH) - The Ethereum Virtual Machine (EVM), Ethereum Development Environment: Test networks - Setting up a private net - Starting up the private network.

UNIT-V	BLOCKCHAIN DEVELOPMENT TOOLS AND HYPERLEDGER TOOLS	9

Development Tools and Frameworks: Compilers, Integrated Development Environments (IDEs), Tools and libraries, Contract development and deployment. Solidity language: Types- Literals – Enums - Function types - Reference types - Global variables - Control structures. Hyperledger: Projects under Hyperledger - Hyperledger as a protocol - The reference architecture. Fabric: Hyperledger Fabric, Membership services, Blockchain services, Consensus services, Distributed ledger, Corda: Architecture - State objects – Transactions – Consensus- Flows and Components.

COURSEOUTCOMES

Oncompletionofthecourse,students willbeableto

CO1	Recognize the basic concept of blockchain and its types, Consensus theorem, Decentralization.
CO2	Interpret how cryptography techniques working in blockchain using RSA and other encryption standard.
CO3	Apply knowledge of Bitcoin techniques, Mining algorithm, PoW, PoS, PoD.
CO4	Analyze the concept of Smart Contracts, Ethereum with EVM and development tools.
CO5	Formulate knowledge of blockchain development tools and hyperledger concepts.

TEXTBOOKS

- ✓ Imran Bashir, “Mastering Blockchain: Distributed ledger technology, decentralization, and smart, contracts explained” Birmingham - Mumbai: Packt, 2nd Edition Kindle, 2018.

.

REFERENCES

- ✓ Narayanan. A, Bonneau .J,Felten .E,Miller .A and Goldfeder .S,BitcoinandCryptocurrency Technologies – AComprehensiveIntroduction" Princeton University Press, 2016.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	-	2	-	2	1	-	2	2
CO2	3	3	3	2	-	2	-	2	1	-	2	2
CO3	3	3	3	2	-	2	-	2	1	-	2	2
CO4	3	3	3	3	2	2	-	2	1	-	2	2
CO5	3	3	3	3	2	2	-	2	1	-	2	2
CO	**3**	**3**	**3**	**2**	**2**	**2**	**-**	**2**	**1**	**-**	**2**	**2**

PROFESSIONAL

ELECTIVES

PROFESSIONAL ELECTIVES

YEAR	III	SEMESTER	V	L	T	P	C
COURSE CODE / COURSE TITLE	191CS539 / INTERNET OF THINGS			3	0	0	3

COURSE OBJECTIVES
✓ To understand the fundamentals of IoT. ✓ To understand the concepts of IoT Architectures and smart objects in IoT ✓ To learn about the basics of IoT Protocols. ✓ To build simple IoT systems with Arduino and Raspberry Pi. ✓ To apply the concept of IoT in the real-world Scenario.

SYLLABUS		
UNIT-I	**INTRODUCTION To IoT**	**9**
Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms Design Methodology		
UNIT-II	**IoT ARCHITECTURES**	**9**
IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models, Simplified IoT Architecture and Core IoT Functional Stack, Fog, Edge and Cloud in IoT, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects.		
UNIT-III	**IoT PROTOCOLS**	**9**
IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks, Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks.		
UNIT-IV	**DESIGN AND DEVELOPMENT**	**9**
Design Methodology, Embedded computing logic, Microcontroller, System on Chips, IoT system building blocks, Arduino, Board details, IDE programming, Raspberry Pi, Interfaces and Raspberry Pi with Python Programming.		
UNIT-V	**CASE STUDIES AND REAL-WORLD APPLICATIONS**	**9**
Real world design constraints - Applications - Asset management, Industrial automation, smart grid, Commercial building automation, Smart cities - participatory sensing - Data Analytics for IoT – Software & Management Tools for IoT Cloud Storage Models & Communication APIs – Cloud for IoT - Amazon Web Services for IoT.		

COURSE OUTCOMES
On completion of the course, students will be able to

CO1	Explain the concept of IoT.
CO2	Analyze various protocols for IoT.
CO3	Design a Portable of an IoT system using Rasperry Pi/Arduino.
CO4	Deploy an IoT application and connect to the cloud.
CO5	Analyze applications of IoT in real time scenario.

TEXT BOOKS

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, “IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things”, Cisco Press, 2017.

REFERENCES

1. ArshdeepBahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015
2. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012 (for Unit 2).
3. Jan Ho¨ller, VlasiosTsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), “Architecting the Internet of Things”, Springer, 2011.
5. Michael Margolis, Arduino Cookbook, “Recipes to Begin, Expand, and Enhance Your Projects”, 2nd Edition, O'Reilly Media, 2011.
https://www.ibm.com/smarterplanet/us/en/?ca=v_smarterplanet.

CO-PO & PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	1	1	-	1	-	-	-	-	-	1			
CO 2	3	3	1	1	-	1	-	-	-	-	-	1			
CO 3	3	3	1	1	1	1	-	-	-	-	-	1			
CO 4	3	3	1	1	1	1	-	-	-	-	-	1			
CO 5	3	3	1	1	1	1	-	-	-	-	-	1			
CO	**3**	**3**	**1**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**1**			

YEAR	III	SEMESTER	V	L	T	P	C
COURSE CODE /COURSETITLE	SOFTWARE RELIABILITY AND METRICS			3	0	0	3

COURSEOBJECTIVES
✓ To introduce to the basic concepts of Software Reliability. ✓ To understand about the varied Reliability models. ✓ To relate the Software Reliability models. ✓ To familiarize about measurement and its scope. ✓ To assess and model the reliability of software systems.

SYLLABUS		
UNIT-I	INTRODUCTION TO SOFTWARE RELIABILITY	9
Basic Concepts –Failure and Faults –Environment –Availability –Modeling –Uses.		
UNIT-II	SOFTWARE RELIABILITY MODELING	9
General Model Characteristic –Historical Development of Models –Model Classification Scheme –Markovian Models –General Concepts –General Poisson Type Models –Binomial Type Models –Poisson Type Models –Fault Reduction Factor for Poisson Type Models.		
UNIT-III	COMPARISON OF SOFTWARE RELIABILITY MODELS	9
Comparison Criteria –Failure Data –Comparison of Predictive Validity of Model Groups –Recommended Models –Comparison of Time Domains –Calendar Time Modeling –Limiting Resource Concept –Resource Usage model –Resource Utilization–Calendar Time Estimation and Confidence Intervals.		
UNIT-IV	FUNDAMENTALS OF MEASUREMENT	9
Measurements in Software Engineering –Scope of Software Metrics –Measurements Theory – Goal based Framework –Software Measurement Validation.		
UNIT-V	UNIT V PRODUCT METRICS	9
Measurement of Internet Product Attributes –Size and Structure –External Product Attributes –Measurement of Quality –Reliability Growth Model –Model Evaluation.		

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Recall the fundamental concepts of Software Reliability.
CO2	Review the basics of Software Reliability Modeling.
CO3	Apply the concepts of Comparison Criteria.
CO4	Relate the concepts of Measurements in Software Engineering.
CO5	Formulate the Measurement of Internet Product Attributes and Quality Management Models.

TEXTBOOKS

- ✓ John D. Musa., Anthony Iannino & amp; Kazuhira O kumoto, ―Software Reliability–Measurement, Prediction, Application, Series in Software Engineering and Technology, Tata McGraw Hill, 1990.

REFERENCES

1. John D. Musa, ―Software Reliability Engineering, Tata McGraw Hill, 2005.
2. Norman E. Fenton & Shari Lawrence Pfleeger, "Software Metrics", 2nd Edition, International Student Edition, 2003.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	-	-	-	2	2	2	2	2
CO2	3	3	3	2	-	-	-	2	2	2	2	2
CO3	3	3	3	3	3	1	-	2	2	2	2	2
CO4	3	3	3	2	-	2	-	2	2	2	2	2
CO5	3	3	3	3	3	2	-	2	2	2	2	2
CO	**3**	**3**	**3**	**2**	**3**	**2**	**-**	**2**	**2**	**2**	**2**	**2**

YEAR	III	SEMESTER	V	L	T	P	C
COURSE CODE /COURSETITLE	PRINCIPLES OF PROGRAMMING LANGUAGES			3	0	0	3

COURSEOBJECTIVES

- ✓ To understand and describe syntax and semantics of programming languages.
- ✓ To study data, data types, and basic statements.
- ✓ To explore call-return architecture and ways of implementing them.
- ✓ To implement object-orientation, concurrency and event handling in programming languages.
- ✓ To develop programs in non-procedural programming paradigms.

SYLLABUS

UNIT-I	SYNTAX AND SEMANTICS	9

Evolution of programming languages – Describing syntax - Context-free grammars - Attribute grammars – Describing semantics – Lexical analysis – Parsing – Recursive - Decent – bottom-upparsing.

UNIT-II	DATA, DATA TYPES, AND BASIC STATEMENTS	9

Names – Variables – Binding – Type checking – Scope – Scope rules – Lifetime and Garbage collection – primitive data types – strings – array types – associative arrays – record types –union types - Pointers and references - Arithmetic expressions - Overloaded operators –type conversions – relational and Booleanexpressions – assignment statements – mixedmodeassignments – control structures – selection – iterations – branching – guarded statements.

UNIT-III	SUBPROGRAMS AND IMPLEMENTATIONS	9

Subprograms – Design issues - Local referencing - Parameter passing - Overloaded methods generic methods – Design issues for functions - Semantics of call and return - Implementing simple subprograms - Stack and dynamic local variables – nested subprograms – blocks – dynamic scoping.

UNIT-IV	OBJECT-ORIENTATION, CONCURRENCY, AND EVENT HANDLING	9

Object-orientation - Design issues for OOP languages - Implementation of object-orientedconstructs – Concurrency - Semaphores - Monitors– Messagepassing Threads - Statement level concurrency - Exception handling – Event handling.

UNIT-V	FUNCTIONAL AND LOGIC PROGRAMMING LANGUAGES	9

Introduction to lambda calculus - Fundamentals of functional programming languages - Programming with Scheme - Programming with ML - Introduction to logic and logic programming – Programming with Prolog – Multi-paradigm languages.

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Remember syntax and semantics of programming languages.
CO2	Design and implement subprogram constructs.
CO3	Apply object-oriented, concurrency, and event handling programming constructs.
CO4	Develop programs in Scheme, ML, and Prolog.
CO5	Evaluate new programming languages.

TEXTBOOKS

1. Michael L. Scott, "Programming Language Pragmatics", Third Edition, Morgan Kaufmann, 2009.
2. R. Kent Dybvig, "The Scheme programming language", Fourth Edition, MIT Press, 2009.
3. Jeffrey D. Ullman, "Elements of ML programming", Second Edition, Prentice Hall, 1998.

REFERENCES

1. Robert W. Sebesta, "Concepts of Programming Languages", Tenth Edition, Addison Wesley, 2012.
2. Richard A. O #39; Keefe, "The craft of Prolog", MIT Press, 2009.
3. W. F. Clocksin and C. S. Mellish, "Programming in Prolog: Using the ISO Standard", Fifth Edition, Springer, 2003.

CO – PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	-	-	-	-	-	1	1	2
CO2	3	2	1	1	-	-	-	-	-	2	1	2
CO3	3	2	1	1	1	-	-	-	-	2	1	2
CO4	3	2	2	1	1	1	1	1	1	2	1	2
CO5	3	2	2	2	1	1	1	1	1	2	1	2
CO	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**

YEAR	III	SEMESTER	V	L	T	P	C
COURSE CODE /COURSETITLE	SOFT COMPUTING			3	0	0	3

COURSEOBJECTIVES

- ✓ Learn the basic concepts of Soft Computing
- ✓ Familiarize with various techniques like neural networks, genetic algorithms and fuzzy systems.
- ✓ Apply soft computing techniques to solve problems.
- ✓ Provide the mathematical background for carrying out the optimization associated with neural network learning.

SYLLABUS

UNIT-I	INTRODUCTION TO SOFT COMPUTING	9

Introduction, Artificial Intelligence, Artificial Neural Networks, Fuzzy Systems, Genetic Algorithm and Evolutionary Programming, Swarm Intelligent Systems, Classification of ANNs, McCulloch and Pitts Neuron Model, Learning Rules: Hebbian and Delta, Perceptron Network, Adaline Network, Madaline Network.

UNIT-II	ARTIFICIAL NEURAL NETWORKS	9

Back propagation Neural Networks, Kohonen Neural Network, Learning Vector Quantization, Hamming Neural Network, Hopfield Neural Network, Bi-directional Associative Memory, Adaptive Resonance Theory Neural Networks, Support Vector Machines, Spike Neuron Models.

UNIT-III	FUZZY SYSTEMS	9

Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets, Classical Relations and Fuzzy Relations, Membership Functions, Defuzzification, Fuzzy Arithmetic and Fuzzy Measures, Fuzzy Rule Base and Approximate Reasoning, Introduction to Fuzzy Decision Making.

UNIT-IV	GENETIC ALGORITHMS	9

Basic Concepts, Working Principles, Encoding, Fitness Function, Reproduction, Inheritance Operators, Cross Over, Inversion and Deletion, Mutation Operator, Bit-wise Operators, Convergence of Genetic Algorithm.

UNIT-V	HYBRID SYSEMS	9

Hybrid Systems, Neural Networks, Fuzzy Logic and Genetic, GA Based Weight Determination, LR-Type Fuzzy Numbers, Fuzzy Neuron, Fuzzy BP Architecture, Learning in Fuzzy BP, Inference by Fuzzy BP, Fuzzy ArtMap: A Brief Introduction, Soft Computing Tools, GA in Fuzzy Logic Controller Design, Fuzzy Logic Controller.

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Apply suitable soft computing techniques for various applications.
CO2	Integrate various soft computing techniques for complex problems.
CO3	Relate with neural networks that can learn from available examples and generalize to form appropriate rules for inference systems.
CO4	Describe with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations.
CO5	Develop some familiarity with current research problems and research methods in Soft Computing Techniques.

TEXTBOOKS

1. N.P.Padhy, S.P.Simon, "Soft Computing with MATLAB Programming", OxfordUniversity Press, 2015.
2. S.N.Sivanandam, S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt. Ltd.,2nd Edition, 2011.
3. S.Rajasekaran, G.A.VijayalakshmiPai, "Neural Networks, Fuzzy Logic and GeneticAlgorithm, Synthesis and Applications ", PHI Learning Pvt. Ltd., 2017.

REFERENCES

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, EijiMizutani, “Neuro-Fuzzy and Soft Computing”, PrenticeHall of India, 2002.
2. KwangH.Lee, “First course on Fuzzy Theory and Applications”,Springer, 2005.
3. George J. Klir and Bo Yuan, “Fuzzy Sets and Fuzzy Logic-Theory and Applications”, Prentice Hall, 1996.
4. James A. Freeman and David M. Skapura, “Neural Networks Algorithms, Applications and Programming Techniques”, Addison Wesley, 2003.

CO- PO MAPPING												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1	1	1	1	-	-	1	-	-	1
CO2	3	2	2	1	1	1	-	-	1	-	-	1
CO3	3	2	1	1	1	1	-	-	1	-	-	1
CO4	3	3	2	1	1	1	-	-	1	-	-	1
CO5	3	3	2	1	1	1	-	-	1	-	-	1
CO	**3**	**2**	**2**	**1**	**1**	**1**	**-**	**-**	**1**	**-**	**-**	**1**

YEAR	III	SEMESTER	V	L	T	P	C
COURSE CODE /COURSETITLE	MULTICORE ARCHITECTURE AND PROGRAMMING			3	0	0	3

COURSEOBJECTIVES
✓ To study the need for multi-core processors, and their architecture. ✓ To understand the challenges in parallel and multi-threaded programming. ✓ To learn about the various parallel programming paradigms. ✓ To develop multi-core programs and design parallel solutions.

SYLLABUS		
UNIT-I	MULTI-CORE PROCESSORS	9
Single core to Multi-core architectures – SIMD and MIMD systems – Interconnection networks – Symmetric and Distributed Shared Memory Architectures – Cache coherence – Performance issues – Parallel program design.		
UNIT-II	PARALLEL PROGRAM CHALLENGES	9
Parallel architectural classification schemes-speedup performance laws- -Program and Network Properties-H/W-S/W Parallelism - Performance – Scalability – Synchronization and data sharing – Data races – Synchronizationprimitives (mutexes, locks, semaphores, barriers) – deadlocks and livelocks – communicationbetween threads (condition variables, signals, message queues and pipes).		
UNIT-III	SHARED MEMORY PROGRAMMING WITH OpenMP	9
Shared memory model – message passing model, OpenMP Execution Model – Memory Model – OpenMP Directives – Work-sharing Constructs -Library functions – Handling Data and Functional Parallelism – Handling Loops – PerformanceConsiderations.		
UNIT-IV	DISTRIBUTED MEMORY PROGRAMMING WITH MPI	9
MPI program execution – MPI constructs – libraries – MPI send and receive – Point-to-point andCollective communication – MPI derived datatypes – Performance evaluation		
UNIT-V	PARALLEL PROGRAM DEVELOPMENT	9
Case studies - n-Body solvers – Tree Search – OpenMP and MPI implementations andcomparison, parallel simulations – parallel programming environment.		

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Describe multi core architectures and identify their characteristics and challenges.
CO2	Identify the issues in programming Parallel Processors.
CO3	Apply the programs using OpenMP and MPI.
CO4	Analyze the programming for serial processors and programming for parallel processors
CO5	Design parallel programming solutions to common problems.

TEXTBOOKS

- ✓ Peter S. Pacheco, ―An Introduction to Parallel Programming‖, Morgan-Kauffman/Elsevier, 2011.
- ✓ Darryl Gove, ―Multicore Application Programming for Windows, Linux, and Oracle Solaris‖, Pearson, 2011.

REFERENCES

1. Michael J Quinn, "Parallel programming in C with MPI and OpenMP‖", Tata McGraw Hill, 2003.
2. Victor Alessandrini, Shared Memory Application Programming, 1st Edition, "Concepts and Strategies in Multi core application programming", Morgan Kaufmann, 2015.
3. Yan Solihin, "Fundamentals of Parallel Multicore Architecture", CRC Press, 2015.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	-	-	1	1	-	-	-	-
CO2	3	3	2	2	-	-	1	1	-	-	-	-
CO3	3	3	2	1	-	-	1	1	-	-	-	-
CO4	3	3	2	1	-	-	1	1	-	-	-	-
CO5	3	3	2	1	-	-	1	1	-	-	-	-
CO	**3**	**3**	**2**	**1**	**-**	**-**	**1**	**1**	**-**	**-**	**-**	**-**

YEAR	III	SEMESTER	V	L	T	P	C
COURSE CODE /COURSETITLE	DATA MINING AND WAREHOUSING			3	0	0	3

COURSEOBJECTIVES
✓ To learn data warehouse concepts, architecture, business analysis and tools. ✓ To understand data pre-processing and data visualization techniques. ✓ To study algorithms for finding hidden and interesting patterns in data. ✓ To understand and apply various classification and clustering techniques using tools.

SYLLABUS		
UNIT-I	DATA WAREHOUSING, BUSINESS ANALYSIS AND ON-LINE ANALYTICALPROCESSING (OLAP)	9
Basic Concepts, Data Warehousing Components,Building a Data Warehouse,Database Architectures for parallel processing - Parallel DBMS Vendors, Multidimensional Data Model, Data Warehouse Schemas for Decision Support, - Concept Hierarchies, Characteristics of OLAP Systems - Typical OLAP Operations, - OLAP and OLTP.		
UNIT-II	DATA MINING – INTRODUCTION	9
Introduction to Data Mining Systems, Knowledge Discovery Process, Data Mining Techniques, Issues, applications, Data Objects and attribute types, Statistical description of data, Data Preprocessing, Cleaning,Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilaritymeasures.		
UNIT-III	DATA MINING - FREQUENT PATTERN ANALYSIS	9
Mining Frequent Patterns, Associations and Correlations, Mining Methods, Pattern Evaluation Method, PatternMining in Multilevel, MultiDimensional Space, Constraint Based Frequent Pattern Mining, lassification usingFrequent Patterns.		
UNIT-IV	CLASSIFICATION AND CLUSTERING	9
Decision Tree Induction, Bayesian Classification, Rule Based Classification, Classification by Back Propagation, Support Vector Machines, Lazy Learners, Model Evaluation and Selection-Techniques to improve Classification Accuracy, Forecasting models: Heuristic methods, predictive modeling, Clustering Techniques, Cluster analysis-Partitioning Methods, Hierarchical Methods, Density Based Methods,Grid Based Methods, Evaluation of clustering, Clustering high dimensional data, Clustering with onstraints,Outlier analysis-outlier detection methods.		
UNIT-V	WEKA TOOL	9
Datasets, Introduction, Iris plants database, Breast cancer database, Auto imports database, Introduction to		

WEKA,The Explorer – Getting started, Exploring the explorer, Learning algorithms, Clustering algorithms, Association–rule learners.

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Learn about Data warehouse system and perform business analysis with OLAP tools.
CO2	Understand the suitable pre-processing and visualization techniques for data analysis.
CO3	Apply frequent pattern and association rule mining techniques for data analysis.
CO4	Analyze appropriate classification and clustering techniques for data analysis.
CO5	Review the weka tool and solve real world data mining problems.

TEXTBOOKS

- ✓ Jiawei Han and MichelineKamber, “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2012.

REFERENCES

1. Alex Berson and Stephen J.Smith, “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition,
2. 35th Reprint 2016.
3. K.P. Soman, ShyamDiwakar and V. Ajay, “Insight into Data Mining Theory and Practice”, Eastern EconomEdition, Prentice Hall of India, 2006.
4. Ian H.Witten and Eibe Frank, “Data Mining: Practical Machine Learning Tools and Techniques”, Elsevier,Second Edition.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	-	-	1	1	-	-	-
CO2	3	2	2	2	-	-	-	1	1	-	-	-
CO3	3	2	2	2	-	-	-	1	1	-	-	-
CO4	3	2	2	2	-	-	-	1	1	-	-	-
CO5	3	2	2	2	-	-	-	1	1	-	-	-
CO	**3**	**2**	**2**	**2**	-	-	-	1	1	-	-	-

YEAR	III	SEMESTER	V	L	T	P	C
COURSE CODE /COURSETITLE	NETWORK DESIGN AND TECHNOLOGIES			3	0	0	3

COURSEOBJECTIVES

- ✓ To Learn the principles required for network design
- ✓ To explore various technologies in the wireless domain
- ✓ To study about 3G and 4G cellular networks
- ✓ To understand the paradigm of Software defined networks

SYLLABUS

UNIT-I	NETWORK DESIGN	9

Advanced multiplexing – Code Division Multiplexing, DWDM and OFDM – Shared medianetworks – switched networks – End to end semantics – Connectionless, Connection oriented,Wireless Scenarios – applications, Quality of Service – End to end level and network levelsolutions. LAN cabling topologies – Ethernet Switches, Routers, Firewalls and L3 switches –Remote Access Technologies and Devices – Modems and DSLs – SLIP and PPP – Corenetworks, and distribution networks.

UNIT-II	WIRELESS NETWORKS	9

IEEE802.16 and WiMAX – Security – Advanced 802.16 Functionalities – Mobile WiMAX -802.16e – Network Infrastructure – WLAN – Configuration – Management Operation – Security– IEEE 802.11e and WMM – QoS – Comparison of WLAN and UMTS – Bluetooth – ProtocolStack – Security – Profiles.

UNIT-III	CELLULAR NETWORKS	9

GSM – Mobility Management and call control – GPRS – Network Elements – Radio ResourceManagement – Mobility Management and Session Management – Small Screen Web Browsingover GPRS and EDGE – MMS over GPRS – UMTS – Channel Structure on the Air Interface –UTRAN –Core and Radio Network Mobility Management – UMTS Security.

UNIT-IV	4G NETWORKS	9

LTE – Network Architecture and Interfaces – FDD Air Interface and Radio Networks –Scheduling – Mobility Management and Power Optimization – LTE Security Architecture –Interconnection with UMTS and GSM – LTE Advanced (3GPPP Release 10) - 4G Networks andComposite Radio Environment – Protocol Boosters – Hybrid 4G Wireless Networks Protocols –Green Wireless Networks – Physical Layer and Multiple Access – Channel Modelling for 4G –Introduction to 5G - Introduction to 5G – 5G-Clarity.

UNIT-V	SOFTWARE DEFINED NETWORKS	9

Introduction – Centralized and Distributed Control and Data Planes – Open Flow – SDNControllers – General Concepts – VLANs – NVGRE – Open Flow – Network Overlays – Types– Virtualization – Data Plane – I/O – Design of SDN Framework.

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Recogn**ize** the components required for designing a network.
CO2	Describe a network at high-level using different networking technologies.
CO3	Apply the various protocols of wireless and cellular networks.
CO4	Analyze the features of 4G and 5G networks.
CO5	Create software defined networks.

TEXTBOOKS

1. Erik Dahlman, Stefan Parkvall, Johan Skold, - 4G: LTE/LTE-Advanced for Mobile Broadband, Academic Press, 2013.
2. Jonathan Rodriguez, ―Fundamentals of 5G Mobile Networks, Wiley, 2015.
3. Larry Peterson and Bruce Davie, "Computer Networks: A Systems Approach", 5th edition, Morgan Kauffman, 2011.

REFERENCES

1. Martin Sauter, "From GSM to LTE, An Introduction to Mobile Networks and Mobile Broad band & Wiley, 2014.
2. Martin Sauter, ―Beyond 3G - Bringing Networks, Terminals and the Web Together: LTE, WiMAX, IMS, 4G Devices and the Mobile Web 2.0, Wiley, 2009.
3. Naveen Chilamkurti, Sherali Zeadally, Hakima Chaouchi, ―Next-Generation Wireless Technologies, Springer, 2013.
4. Paul Goransson, Chuck Black, ―Software Defined Networks: A Comprehensive Approach, Morgan Kauffman, 2014.
5. Savo G Glisic, ―Advanced Wireless Networks – 4G Technologies, John Wiley & Sons, 2007.
6. Thomas D.Nadeau and Ken Gray, ―SDN – Software Defined Networks, O"Reilly Publishers, 2013.
7. Ying Dar Lin, Ren-Hung Hwang and Fred Baker, ―Computer Networks: An Open Source Approach, McGraw Hill, 2011

CO- PO MAPPING												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	2	-	1	1	-	-	-	-	-
CO2	3	3	3	2	-	1	1	-	-	-	-	-
CO3	3	3	2	2	-	1	1	-	-	-	-	-
CO4	3	2	2	1	-	1	1	-	-	-	-	-
CO5	3	3	3	2	-	1	1	-	-	-	-	-
CO	**3**	**3**	**2**	**1**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**

YEAR	III	SEMESTER	V	L	T	P	C
COURSE CODE /COURSETITLE	FUZZY LOGIC AND ARTIFICIAL NEURAL NETWORK			3	0	0	3

COURSEOBJECTIVES

- ✓ Describe the concepts of fuzzy logic principles.
- ✓ Summarize the applications of fuzzy systems.
- ✓ Discuss the models of ANN.
- ✓ Compose the types of genetic algorithm and optimization technique.
- ✓ Organize the various application related to design and manufacture.

SYLLABUS

UNIT-I	INTRODUCTION TO FUZZY LOGIC PRINCIPLES	9

Basic concepts: fuzzy set theory- crisp sets and fuzzy sets- complements- unionintersection - combination of operation- general aggregation operations- fuzzy relationscompatibility relations-orderings- morphisms- fuzzy relational equations- fuzzy systems.

UNIT-II	ADVANCED FUZZY LOGIC APPLICATIONS	9

Fuzzy logic controllers – principles – review of control systems theory – various industrial applications of FLC adaptive fuzzy systems – fuzzy decision making – Multiobjective decision making – fuzzy classification – means clustering – fuzzy pattern recognition – image processingapplications – systactic recognition – fuzzy optimization.

UNIT-III	INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS	9

Fundamentals of neural networks – model of an artificial neuron – neural network architectures – Learning methods – Taxonomy of Neural network architectures – Standard back propagationalgorithms – selection of various parameters – variations applications of back propagationalgorithms, Learning Rules.

UNIT-IV	RECENT ADVANCES	9

Fundamentals of genetic algorithms – genetic modeling – hybrid systems – integration of fuzzy logic, neural networks and genetic algorithms – nontraditional optimization techniques like ant colony optimization – Particle swarm optimization and artificial immune systems – applications in design and manufacturing.

UNIT-V	APPLICATIONS	9

Neural network applications: Process identification, control, fault diagnosis and load forecasting.

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	State the skill in basic understanding on fuzzy logic.
CO2	Classify the various fuzzy logic applications.
CO3	Explore the functional components of neural classification and functional components.
CO4	Develop and implement a basic trainable neural network to design and manufacturing.
CO5	Discuss the various applications of Neural Network.

TEXTBOOKS

- ✓ Rajasekaran. S..VijayalakshmiPai. G.A. Neural Networks, Fuzzy Logic and Genetic Algorithms, Prentice Hall of India Private Limited, 2003.
- ✓ Timothy J.Ross, Fuzzy logic with Engineering Applications, McGraw Hill, 2017.
- ✓ Zurada J.M. Introduction to Artificial Neural Systems, Jaico publishing house, 2016.

REFERENCES

1. Klir.G, Yuan B.B. Fuzzy sets and Fuzzy Logic Prentice Hall of India private limited 1997.
2. Laurene Fausett, Fundamentals of Neural Networks, Prentice hall, 1992.
3. Gen, M. and Cheng R. Genetic Algorithm and Engineering Design, john wiley 1997

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	-	-	-	-	-	-	-	-
CO2	3	3	2	1	1	-	-	-	-	-	-	-
CO3	3	3	2	2	1	-	-	-	1	-	-	-
CO4	3	3	3	2	2	1	-	-	1	1	-	-
CO5	3	3	3	2	2	1	-	-	1	1	-	-
CO	**3**	**3**	**2**	**2**	**2**	**1**	**-**	**-**	**1**	**1**	**-**	**-**

YEAR	III	SEMESTER	V	L	T	P	C
COURSE CODE /COURSETITLE	SECURITY PRACTICES			3	0	0	3

COURSEOBJECTIVES

- ✓ To learn the core fundamentals of system and web security concepts.
- ✓ To have thorough understanding in the security concepts related to networks.
- ✓ To deploy the security essentials in IT Sector.
- ✓ To be exposed to the concepts of Cyber Security and encryption concepts.
- ✓ To perform a detailed study of Privacy and Storage security and related issues.

SYLLABUS

UNIT-I	SYSTEM SECURITY	9

Building a secure organization- A Cryptography primer- detecting system Intrusion- Preventingsystem Intrusion- Fault tolerance and Resilience in cloud computing environments- Security webapplications, services and servers.

UNIT-II	NETWORK SECURITY	9

Internet Security - Botnet Problem- Intranet security- Local Area Network Security - Wireless Network Security - Wireless Sensor Network Security- Cellular Network Security- Optical Network Security- Optical wireless Security.

UNIT-III	SECURITY MANEGEMENT	9

Information security essentials for IT Managers- Security Management System - Policy DrivenSystem Management- IT Security - Online Identity and User Management System - Intrusion andDetection and Prevention System.

UNIT-IV	CYBER SECURITY AND CRYPTOGRAPHY	9

Cyber Forensics- Cyber Forensics and Incidence Response - Security e-Discovery – NetworkForensics - Data Encryption- Satellite Encryption - Password based authenticated Key establishmentProtocols.

UNIT-V	PRIVACY AND STORAGE SECURITY	9

Privacy on the Internet - Privacy Enhancing Technologies - Personal privacy Policies - Detection of Conflicts in security policies- privacy and security in environment monitoring systems. Storage Area Network Security - Storage Area Network Security Devices - Risk management - Physical Security Essentials.

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Recognize the core fundamentals of system security
CO2	Classify the security concepts related to networks in wired and wireless scenario
CO3	Execute and Manage the security essentials in IT Sector
CO4	Experiment the concepts of Cyber Security and encryption Concepts
CO5	Build a thorough knowledge in the area of Privacy and Storage security and related Issues.

TEXTBOOKS

- ✓ Information Security: Principles and Practice, Second edition-2018.
- ✓ Computer and Information Security Handbook Book**,** Third Edition-2017.

REFERENCES

1. Wenliang Du, Computer Security: A Hands-on approach,May -2019.
2. Stallings and Brown, Computer Security: Principles and Practice, Prentice Hall, 3rd edition,2014.
3. Dieter Gollmann, Computer Security, 3rd edition-2011.

CO- PO MAPPING

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CO3	3	2	2	1	-	1	-	1	-	-	1	1
CO4	3	2	2	1	-	1	-	1	2	1	2	1
CO5	3	2	2	1	-	1	-	1	2	1	2	1
CO	**3**	**2**	**2**	**1**		**1**		**1**	**2**	**1**	**1**	**1**

YEAR	III	SEMESTER	VI	L	T	P	C
COURSE CODE /COURSETITLE	SOFTWARE TESTING			3	0	0	3

COURSEOBJECTIVES

- ✓ Tolearnthecriteria fortestcases.
- ✓ Tolearnthedesign of testcases.
- ✓ Tounderstand the needs of the testing.
- ✓ To Evaluate working products
- ✓ To apply testautomationtechniques

SYLLABUS

UNIT-I	INTRODUCTION	9

Testing as an Engineering Activity – Testing as a Process – Testing Maturity Model- Testingaxioms – Basic definitions – Software Testing Principles – The Tester‘s Role in a SoftwareDevelopment Organization – Origins of Defects – Cost of defects – Defect Classes – The DefectRepository and Test Design –Defect Examples- Developer/Tester Support of Developing a defect Repository

UNIT-II	TEST CASE DESIGN STRATEGIES	9

Test case Design Strategies – Using Black Box Approach to Test Case Design – Boundary ValueAnalysis – Equivalence Class Partitioning – State based testing – Cause-effect graphing – Compatibility testing – user documentation testing – domain testing - Random Testing –Requirements based testing – Using White Box approach to Test design – Test Adequacy, Criteria – static testing vs. structural testing – code functional testing – Coverage and ControlFlow Graphs – Covering Code Logic – Paths – code complexity testing – Additional White boxtesting approaches- Evaluating Test Adequacy Criteria.

UNIT-III	LEVELS OF TESTING	9

The need for Levels of Testing – Unit Test – Unit Test Planning – Designing the Unit Tests – The Test harness – Running the Unit tests and Recording results – Integration tests – DesigningIntegration Tests – integration Test Planning – Scenario testing – Defect bash elimination, System Testing – Acceptance testing – Performance testing – Regression Testing –Internationalization testing – Ad-hoc testing – Alpha, Beta Tests Testing OO systems –Usability and Accessibility testing – Configuration testing –Compatibility testing – Testing thedocumentation – Website testing.

UNIT-IV	TEST MANAGEMENT	9

People and organizational issues in testing – Organization structures for testing teams – testingservices – Test planning – Test Plan Components – Test Plan Attachments – Locating Test Items– test management – test process – Reporting Test Results – Introducing the test specialist –Skills needed by a test specialist – Building a Testing group- The Structure of Testing Group - The Technical Training Program

UNIT-V	TEST AUTOMATION	9

Software test automation – skills needed for automation – scope of automation – design andarchitecture for automation – requirements for a test tool – challenges in automation – Testmetrics and measurements – project, progress and productivity metrics, Selenium tools.

COURSEOUTCOMES

Oncompletionofthecourse,students willbeableto

CO1	Design test cases suitable for a software development for different domains.
CO2	Identify suitable tests to be carried out.
CO3	Prepare test planning based on the document.
CO4	Document test plans and test cases designed.
CO5	Make use of the latest test tool for functional and performance testing.

TEXTBOOKS

.

1. SrinivasanDesikan and Gopalaswamy Ramesh, "Software Testing – Principles and Practices", Pearson Education, 2006.
2. Ron Patton, "Software Testing", Second Edition, Sams Publishing, Pearson Education, 2007.

REFERENCES

1. Ilene Burnstein, "Practical Software Testing", Springer International Edition, 2003.
2. Edward Kit, "Software Testing in the Real World – Improving the Process", Pearson Education, 1995.
3. Boris Beizer, "Software Testing Techniques" – 2nd Edition, Van Nostrand Reinhold, New York, 1990.
4. Aditya P. Mathur, "Foundations of Software Testing _ Fundamental Algorithms and Techniques", Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	2	2	2	3	3	3	3
CO2	3	3	3	3	2	2	2	2	3	3	3	3
CO3	3	3	3	3	2	2	2	2	3	3	3	3
CO4	3	3	3	3	2	2	2	2	3	3	3	3
CO5	3	3	3	3	2	2	2	2	3	3	3	3
CO	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**3**

YEAR	III	SEMESTER	VI	L	T	P	C
COURSE CODE /COURSETITLE	SENTIMENT ANALYSIS			3	0	0	3

COURSEOBJECTIVES

- To know a user or audience opinion on a target object
- Analysing a vast amount of text from various sources.
- Identify key emotional triggers.

SYLLABUS

UNIT-I	INTRODUCTION	9

Need for Sentiment Analysis – Problem of Sentiment Analysis - Subjectivity – Stance – Words to Discourse – Pragmatics – Natural Language Processing Issues – Opinion Definition – Sentiment Analysis Tasks – Opinion Summarization – Types of Opinion – Subjectivity and Emotion

UNIT-II	GEOMETRICALAPPLICATIONSOFDIFFERENTIALCALCULUS	9

Document Sentiment Classification Sentiment Classification Using Supervised Learning – Unsupervised Learning – Rating Prediction – Cross- Domain Sentiment Classification – Cross-Language Sentiment Classification – Sentence Subjectivity And Classification – Subjectivity Classification –Sentence Sentiment Classification – Conditional Sentences – Sarcastic Sentences – CrossLanguage Subjectivity and Sentiment Classification – Discourse Information for Sentiment Classification.

UNIT-III	FUNCTIONSOFSEVERALVARIABLES	9

Aspect Based Sentiment Analysis Aspect sentiment classification –Basic rules of opinions and Compositional Semantics – Aspect Extraction –Identifying Resource usage aspect – Simultaneous Opinion Lexicon Expansion And Aspect Extraction – Grouping aspects into categories – Entity, Opinion Hold and Timing Extraction – Coreference Resolution and Word Sense Disambiguation – Aspect and Entity Extraction – Sentiment Lexicon Generation – Corpus Based Approach – Dictionary Based Approach – Desirable and Undesirable Facts

UNIT-IV	ORDINARYDIFFERENTIALEQUATIONS	9

Opinion Summarization Aspect Based Opinion Summarization –Improvements to Aspect-Based Opinion Summarization – Contrastive view Summarization – Traditional Summarization – Analysis of Comparative Opinions –Identifying Comparative Sentences – Identifying Preferred Entities –Opinion Search and Retrieval – Opinion Spam Detection – Types of Spam Detection - Supervised and Un-Supervised Approach –Group Spam Detection

UNIT-V		9

Tools for Sentiment Analysis Detecting Fake or Deceptive Opinions - Quality of Review – Quality as Regression Model – Other Methods – Case Study – Sentiment Analysis Applications – Tools for Sentiment Analysis – Semantria – Meltwater – Google Analytics – Face Book Insights – Tweetstats.

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Underline the core fundamentals of social sentiment.
CO2	Express the knowledge about adaptive customer's service and their applications.
CO3	Use the ability of AI to generate and understand natural language.
CO4	Analyze the improvement of customer service by evaluating customer reactions in real-time.
CO5	Establish customers support in conveying the desired emotion in their messages.

TEXTBOOKS

- ✓ Sentiment Analysis: Mining Opinions, Sentiments, and Emotions Hardcover by Bing Liu– 4 June 2015.
- ✓ Fundamentals of Sentiment Analysis and Its Applications, March 2016.

REFERENCES

1. Abdul-Mageed, M., M.T. Diab, and M. Korayem. Subjectivity and sentiment analysis of modern standard Arabic. In Proceedings of the 49th Annual Meeting of the Association for Computational Linguistics: short papers, 2011. Akkaya, C., J. Wiebe, and R. Mihalcea. Subjectivity word sense disambiguation. In Proceedings of the 2009.Conference on Empirical Methods in Natural Language Processing (EMNLP-2009), 2009.
2. Alm, C.O. Subjective natural language problems: motivations, applications, characterizations, and implications. In Proceedings of the 49th Annual Meeting of the Association for Computational Linguistics: shortpapers (ACL-2011), 2011.
3. Andreevskaia, A. and S. Bergler. Mining WordNet for fuzzy sentiment: Sentiment tag extraction from WordNet glosses. In Proceedings of Conference of the European Chapter of the Association for Computational Linguistics (EACL-06), 2006.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	1	-	-	-	-	-	-	-
CO2	2	1	1	1	1	-	-	-	-	1	1	1
CO3	2	1	1	1	1	-	-	-	1	1	1	2
CO4	2	1	1	1	1	-	-	-	1	1	2	2
CO5	2	1	1	1	1	-	-	-	2	1	2	2
CO	**2**	**1**	**1**	**1**	**1**	**-**	**-**	**-**	**1**	**1**	**2**	**2**

YEAR	III	SEMESTER	VI	L	T	P	C
COURSE CODE /COURSETITLE	BIO- INFORMATICS			3	0	0	3

COURSEOBJECTIVES

- ✓ To understand the need for bio informatics in biological database.
- ✓ To study the various algorithm using in sequential analysis.
- ✓ To learn the latent trends in biological systems.
- ✓ To design appropriate bio informatics data using PERL programming.

SYLLABUS

UNIT-I	INTRODUCTION	9

Introduction to Operating systems, Linux commands, File transfer protocols ftp and telnet, Introduction to Bioinformatics and Computational Biology, Biological sequences, Biological databases, Genome specific databases, Data file formats, Data life cycle, Database management system models, Basics of Structured Query Language (SQL).

UNIT-II	SEQUENTIAL ANALYSIS AND ALGORITHM	9

Sequence Analysis, Pair wise alignment, Dynamic programming algorithms for computing edit distance, string similarity, shotgun DNA sequencing, end space free alignment. Multiple sequence alignment, Algorithms for Multiple sequence alignment, Generating motifs and profiles, Local and Global alignment, Needleman and Wunsch algorithm, Smith Waterman algorithm, BLAST, PSIBLAST and PHIBLAST algorithms.

UNIT-III	PHYLOGENETIC AND MOLECULAR APPROACHES	9

Introduction to phylogenetics, Distance based trees UPGMA trees, Molecular clock theory, Ultra-metric trees, Parsimonious trees, Neighbour joining trees, trees based on morphological traits, Bootstrapping. Protein Secondary structure and tertiary structure prediction methods, Homology modeling, abinitio approaches, Threading, Critical Assessment of Structure Prediction and Structural genomics.

UNIT-IV	MACHINE LEARNING IN INFORMATICS	9

Machine learning techniques: Artificial Neural Networks in protein secondary structure prediction, Hidden Markov Models for gene finding, Decision trees, Support Vector Machines. Introduction to Systems Biology and Synthetic Biology, Microarray analysis, DNA computing, Bioinformatics approaches for drug discovery, Applications of informatics techniques in genomics and proteomics: Assembling the genome, STS content mapping for clone contigs, Functional annotation, Peptide mass fingerprinting.

UNIT-V	PERL FOR BIO INFORMATICS	9

Basics of PERL programming for Bioinformatics: Data types: scalars and collections, operators, Program control flow constructs, Library Functions: String specific functions, User defined functions, File handling.

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Learn the basic concepts of Bio informatics.
CO2	Define various algorithms used for genetic structure.
CO3	Apply distance based trees based on morphological.
CO4	Analyze efficient technique methods in protein secondary structure prediction.
CO5	Implement PERL programming for bio informatics.

TEXTBOOKS

1. Introduction to Bioinformatics by Arthur K. Lesk , Oxford University Press.2002.
2. Algorithms on Strings, Trees and Sequences by Dan Gusfield, Cambridge University Press. 2007.

REFERENCES

1. Yi-Ping Phoebe Chen (Ed), “Bio Informatics Technologies”, First Indian Reprint, Springer
2. Verlag, 2007.
3. N.J. Chikhale and Virendra Gomase, "Bioinformatics- Theory and Practice", Himalaya
4. Publication House, India, 2007.
5. Zoe lacroix and Terence Critchlow, “Bio Informatics – Managing Scientific data”, First
6. Indian Reprint, Elsevier, 2004.
7. Bryan Bergeron, “Bio Informatics Computing”, Second Edition, Pearson Education, 2003.
8. Arthur M Lesk, “Introduction to Bioinformatics”, Second Edition, Oxford UniversityPress, 2005.
9. Burton. E. Tropp, “Molecular Biology: Genes to Proteins “, 4th edition, Jones and Bartlett
10. Publishers, 2011.
11. Dan Gusfield, “Algorithms on Strings Trees and Sequences”, Cambridge University Press,
12. 1997.
13. P. Baldi, S Brunak , Bioinformatics, “A Machine Learning Approach “, MIT Press, 1998.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	-	-	-	-	1	-	-	1
CO2	3	2	2	1	-	-	-	-	1	-	-	1
CO3	3	2	2	1	-	-	-	-	1	-	-	1
CO4	3	2	2	2	-	-	-	-	1	-	-	1
CO5	3	2	3	1	1	-	-	-	1	-	-	1
CO	**3**	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**1**	**-**	**-**	**1**

YEAR	III	SEMESTER	VI	L	T	P	C
COURSE CODE /COURSETITLE	VIRTUAL AND AUGMENTED REALITY			3	0	0	3

COURSEOBJECTIVES
✓ To understand the fundamentals of the Virtual Reality. ✓ Explore the various Health Hazards. ✓ Gather knowledge about the Interaction Patterns and Techniques. ✓ Explore the techniques behind Augmented Reality. ✓ To understand the concepts of virtual reality infrastructure.

SYLLABUS		
UNIT-I	INTRODUCTION	9
What is Virtual Reality - A History of VR - An Overview of Various Realities - Immerson, Presence, and Reality Trade-Offs - The Basics: Design Guidelines- Perception - Objective and Subjective Reality - Perceptual Models and Processes - Perceptual Modalities - Perception of Space and Time - Perceptual Stability, Attention, and Action - Perception: Design Guidelines.		
UNIT-II	VR DEVELOPMENT PROCESS	9
Motion Sickness - Eye Strain, Seizures, and Aftereffects - Hardware Challenges – Latency - Measuring Sickness - Summary of Factors That Contribute to Adverse Effects - Examples of Reducing Adverse Effects - Adverse Health Effects: Design Guidelines - High-Level Concepts of Content Creation – Environmental Design - Affecting Behavior - Transitioning to VR Content Creation - Content Creation.		
UNIT-III	CONTENT CREATION CONSIDERATIONS FOR VR	9
Design Guidelines - Human-Centered Interaction - VR Interaction Concepts - Input Devices – Interaction Patterns and Techniques - Interaction: Design Guidelines - Philosophy of Iterative Design – The Define Stage - The Make Stage - The Learn Stage - Iterative Design: Design Guidelines - The Present and Future State of VR.		
UNIT-IV	VR ON THE WEB AND VR ON THE MOBILE	9
Introduction to Augmented Reality - Displays – Tracking – Computer vision for Augmented Reality.		
UNIT-V	APPLICATIONS	9
Calibration and Registration – Visual Coherence – Situated Visualization – Interaction – Modeling and Annotation – Authoring - Navigation.		

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Explore the basic concepts of the Virtual Reality.
CO2	Identify the various health effects of Virtual Reality.
CO3	Apply the concepts of Interaction Patterns and Techniques.
CO4	Analyze the Augmented Reality Techniques.
CO5	Describe infrastructure for virtual reality.

TEXTBOOKS

1. Jason Jerald, "The VR Book: Human-Centered Design for Virtual Reality", Morgan & Claypool Publishers, 2016.
2. Dieter Schmalstieg, Tobias Hollerer, " Augumented Reality : Principles and Practice", Pearson, 2016.

REFERENCES

- ✓ Tony Parisi, "Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web and Mobile", O'Reilly Media, 2015.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1	1	-	-	-	-	-	-	2-
CO2	3	3	3	1	1	-	-	-	-	-	-	2
CO3	3	3	3	1	1	-	-	-	-	-	-	2
CO4	3	3	3	1	1	-	-	-	-	-	-	2
CO5	3	3	3	1	1	-	-	-	-	-	-	2
CO	**3**	**3**	**3**	**1**	**1**	-	-	-	-	-	-	**2**

YEAR	III	SEMESTER	VI	L	T	P	C
COURSE CODE /COURSETITLE	REAL TIME SYSTEMS			3	0	0	3

COURSEOBJECTIVES

- ✓ To learn real time operating system concepts, the associated issues & Techniques.
- ✓ To understand design and synchronization problems in Real Time System.
- ✓ To explore the concepts of real time databases.
- ✓ To develop and evaluation techniques present in Real Time System.

SYLLABUS

UNIT-I	REAL TIME SYSTEM AND SCHEDULING	9

Introduction, Structure of a Real Time System, Task classes, Performance Measures for Real Time Systems, Estimating Program Run Times, Issues in Real Time Computing, Task Assignment and Scheduling, Classical uni-processor scheduling algorithms, Fault Tolerant Scheduling.

UNIT-II	SOFTWARE REQUIREMENTS ENGINEERING	9

Requirements engineering process, types of requirements, requirements specification for real timesystems, Formal methods in software specification, Structured Analysis and Design, object orientedanalysis and design and unified modeling language, organizing the requirements document, organizingand writing documents, requirements validation and revision.

UNIT-III	INTERTASK COMMUNICATION AND MEMORY MANAGEMENT	9

Buffering data, Time relative Buffering, Ring Buffers, Mailboxes, Queues, Critical regions, Semaphores,Other Synchronization mechanisms, Deadlock, Priority inversion, Process stack management, Run timering buffer, maximum stack size, multiple stack arrangement, Memory management in task control block, wrapping, overlays, Block page management, replacement algorithms, memory locking, working sets,real time garbage collection, contiguous file systems.

UNIT-IV	REAL TIME DATABASES	9

Real time Databases, Basic Definition, Real time Vs General Purpose Databases, Main Memory Databases, Transaction priorities, Transaction Aborts, Concurrency control issues, Disk Scheduling Algorithms, Twophase approach to improve Predictability, Maintaining Serialization, Consistency, Databases for Hard Real Time Systems.

UNIT-V	EVALUATION TECHNIQUES AND CLOCK SYNCHRONIZATION	9

Reliability Evaluation Techniques, Obtaining parameter values, Reliability models for Hardwareredundancy, Software error models. Clock Synchronization, Clock, A Non-fault– Tolerant, Synchronization Algorithm, Impact of faults, Fault Tolerant Synchronization in Hardware, Fault TolerantSynchronization in software.

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Remember Real-time scheduling and schedule-ability analysis, including clock-driven and priority-driven scheduling.
CO2	Identify the Theoretical background (specification/verification) and practical knowledge of real-time operating systems.
CO3	Apply the use of multitasking techniques in real time systems, understand the fundamental concepts of real-time operating systems and memory management.
CO4	Analyze the evaluation techniques present in Real Time System data base.
CO5	Evaluate and compare types and Functionalities in commercial OS, application development using RTOS.

TEXTBOOKS

1. C.M. Krishna, Kang, G.Shin, "Real Time Systems", McGraw Hill, 1997.
2. Herma K., "Real Time Systems – Design for distributed Embedded Applications", Kluwer Academic, 1997.

REFERENCES

1. Silberschatz Galvin Gagne "Operating System Concepts", 6th ed, John Wiley, 2003.
2. Charles Crowley, "Operating Systems-A Design Oriented approach" McGraw Hill,1997.
3. Raj Kamal, "Embedded Systems- Architecture, Programming and Design" Tata McGraw Hill,2006.
4. Karim Yaghmour, Building Embedded Linux System", O'reilly Pub,2003.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	-	-	-	-	-	-	-	2
CO2	3	1	1	1	-	-	-	-	-	2	1	2
CO3	3	2	1	1	1	1	1	-	-	2	1	2
CO4	3	2	2	1	1	1	1	2	1	3	1	2
CO5	3	2	2	2	1	1	1	2	1	3	1	2
CO	**3**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**2**	**1**	**2**

YEAR	III	SEMESTER	VI	L	T	P	C
COURSE CODE /COURSETITLE	MALWARE ANALYSIS IN DATA SCIENCE			3	0	0	3

COURSEOBJECTIVES

- ✓ To learn the concept of malware and reverse engineering.
- ✓ To understand the configuration of JIT debugger for shell code analysis.
- ✓ To study the concept of debugging.
- ✓ To Implement tools and techniques of malware analysis.

SYLLABUS

UNIT-I	INTRODUCTION	9

Fundamentals of Malware Analysis (MA), Reverse Engineering Malware (REM) Methodology, Brief Overview of Malware analysis lab setup and configuration, Introduction to key MA tools and techniques, Behavioral Analysis vs. Code Analysis, Resources for Reverse-Engineering Malware (REM) Understanding Malware Threats, Malware indicators, Malware Classification, Examining Clam AV Signatures, Creating Custom Clam AV Databases.

UNIT-II	MALWARE FORENSICS	9

Using TSK for Network and Host Discoveries, Using Microsoft Offline API to Registry Discoveries, Identifying Packers using PEiD, Registry Forensics with Reg Ripper Plug-ins:, Bypassing Poison Ivy's Locked Files, Bypassing Conficker's File System ACL Restrictions, Detecting Rogue PKI Certificates.

UNIT-III	MALWARE AND KERNEL DEBUGGING	9

Opening and Attaching to Processes, Configuration of JIT Debugger for Shellcode Analysis, Controlling Program Execution, Setting and Catching Breakpoints, Debugging with Python Scripts and Py Commands, DLL Export Enumeration, Execution, and Debugging, Debugging a VMware Workstation Guest (on Windows), Debugging a Parallels Guest (on Mac OS X).

UNIT-IV	MEMORY FORENSICS AND VOLATILITY	9

Memory Dumping with MoonSols Windows Memory Toolkit, Accessing VM Memory Files, Overview of Volatility, Investigating Processes in Memory Dumps, Code Injection andExtraction, Detecting and Capturing Suspicious Loaded DLLs, Finding Artifacts in ProcessMemory, Identifying Injected Code with Malfind and YARA.

UNIT-V	RESEARCHING AND MAPPING SOURCE DOMAINS/IPS	9

Using WHOIS to Research Domains, DNS Hostname Resolution, Querying Passive DNS,Checking DNS Records, Reverse IP Search New Course Form, Creating Static Maps,Creating Interactive Maps.

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Describe the concept of different types of malware in data science.
CO2	Explain the concept of malware and reverse engineering.
CO3	Demonstrate debugging with python Scripts.
CO4	Analyze Artifacts in Process Memory.
CO5	Design techniques of malware analysis.

TEXTBOOKS

- ✓ **"**Malware Data Science: Attack Detection and Attribution" by Joshua saxe, Hillary sanders, September 2018.

REFERENCES

- ✓ "Data Science from Scratch" by Joel Grus , May 2015.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	-	1	1	-	-	-	-	1
CO2	3	3	2	1	-	1	1	-	-	-	-	1
CO3	3	3	3	2	-	1	1	-	-	-	-	1
CO4	3	3	2	1	-	1	1	-	-	-	-	1
CO5	3	3	2	1	-	1	1	-	-	-	-	1
CO	**3**	**3**	**2**	**1**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**1**

YEAR	IV	SEMESTER	VII	L	T	P	C
COURSE CODE /COURSETITLE	INFORMATION RETRIEVAL TECHNIQUES			3	0	0	3

COURSEOBJECTIVES

- ✓ To understand the basics of Information Retrieval.
- ✓ To learn different modeling and retrieval evaluation for Information Retrieval.
- ✓ To understand machine learning techniques for text classification and clustering.
- ✓ To understand various search engine system operations.
- ✓ To learn different techniques of recommender system.

SYLLABUS

UNIT-I	INTRODUCTION	9

Information Retrieval, Early Developments, The IR Problem, The User's Task, Information versus Data Retrieval, The IR System, The Software Architecture of the IR System, The Retrieval and Ranking Processes, The Web, The e-Publishing Era, How the web changed Search, Practical Issues on the Web, How People Search, Search Interfaces Today, Visualization in Search Interfaces.

UNIT-II	MODELINGAND RETRIEVAL EVALUATION	9

Basic IR Models, Boolean Model, TF-IDF (Term Frequency/Inverse Document Frequency) Weighting, Vector Model, Probabilistic Model, Latent Semantic Indexing Model, Neural Network Model, Retrieval Evaluation, Retrieval Metrics, Precision and Recall, Reference Collection, User-based Evaluation, Relevance Feedback and Query Expansion, Explicit Relevance Feedback.

UNIT-III	TEXT CLASSIFICATION AND CLUSTERING	9

A Characterization of Text Classification, Unsupervised Algorithms: Clustering, Naive Text Classification, Supervised Algorithms, Decision Tree, k-NN Classifier, SVM Classifier, Feature Selection or Dimensionality Reduction, Evaluation metrics, Accuracy and Error, Organizing the classes, Indexing and Searching, Inverted Indexes, Sequential Searching, Multi-dimensional Indexing.

UNIT-IV	WEB RETRIEVAL AND WEB CRAWLING	9

The Web, Search Engine Architectures, Cluster based Architecture, Distributed Architectures, Search Engine Ranking, Link based Ranking, Simple Ranking Functions, Learning to Rank, Evaluations, Search Engine Ranking, Search Engine User Interaction, Browsing, Applications of a Web Crawler, Taxonomy, Architecture and Implementation, Scheduling Algorithms, Evaluation.

UNIT-V	RECOMMENDER SYSTEM	9

Recommender Systems Functions, Data and Knowledge Sources, Recommendation Techniques, Basics of Content-based Recommender Systems, High Level Architecture, Advantages and Drawbacks of Content-based Filtering, Collaborative Filtering, Matrix factorization models, Neighborhood models.

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Use an open source search engine framework and explore its capabilities.
CO2	Analyze different modeling for Information Retrieval.
CO3	Apply appropriate method of classification or clustering.
CO4	Demonstrate the entire process flow of a web search engine
CO5	Design and implement a recommender system.

TEXTBOOKS

- ✓ Ricardo Baeza-Yates and Berthier Ribeiro-Neto, "Modern Information Retrieval: The Concepts and Technology behind Search", Second Edition, ACM Press Books, 2011.
- ✓ Ricci, F, Rokach, L. Shapira, B.Kantor, "Recommender Systems Handbook", First Edition, 2011.

REFERENCES

1. C. Manning, P. Raghavan, and H. Schütze, "Introduction to Information Retrieval", Cambridge University Press, 2008.
2. Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, "Information Retrieval: Implementing and Evaluating Search Engines", The MIT Press, 2010.

CO- PO MAPPING

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CO3	3	2	1	1	1	-	-	-	-	-	-	-
CO4	3	1	1	1	1	-	-	-	-	-	-	-
CO5	3	1	1	-	1	-	-	-	-	-	-	-
CO	**3**	**2**	**1**	**1**	1	-	-	-	-	-	-	-

YEAR	IV	SEMESTER	VII	L	T	P	C
COURSE CODE /COURSETITLE	SOCIAL NETWORK ANALYSIS			3	0	0	3

COURSEOBJECTIVES

- ✓ Understand the concept of semantic web and related applications.
- ✓ Learn knowledge representation using ontology.
- ✓ Understand human behavior in social web and related communities.
- ✓ Analyze the visualization of social networks.
- ✓ Summarize how networks evolve in time.

SYLLABUS

UNIT-I	INTRODUCTION	9

Introduction to Semantic Web: Limitations of current Web, Development of Semantic Web, Emergence of the Social Web, Social Network analysis: Development of Social Network Analysis, Key concepts and measures in network analysis, Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities, Web-based networks, Applications of Social Network Analysis.

UNIT-II	MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION	9

Ontology and their role in the Semantic Web: Ontology-based knowledge Representation, Ontology languages for the Semantic Web: Resource Description Framework, Web Ontology Language,Modelling and aggregating social network data: State-of-the-art in network data representation, Ontological representation of social individuals, Ontological representation of social relationships, Aggregating and reasoning with social network data, Advanced representations.

UNIT-III	EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS	9

Extracting evolution of Web Community from a Series of Web Archive, Detecting communities in social networks, Definition of community, Evaluating communities, Methods for community detection and mining, Applications of community mining algorithms, Tools for detecting communities social network infrastructures and communities, Decentralized online social networks, multi-Relational characterization of dynamic social network communities.

UNIT-IV	PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES	9

Understanding and predicting human behaviour for social communities, User data management, Inference and Distribution, Enabling new human experiences, Reality mining, Context, Awareness, Privacy in online social networks, Trust in online environment, Trust models based on subjective logic, Trust network analysis, Trust transitivity analysis, Combining trust and reputation, Trust derivation based on trust comparisons, Attack spectrum and countermeasures.

UNIT-V	VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS	9
A Learning Based Approach for Real Time Emotion Classification of Tweets, A New Linguistic Approach to Assess the Opinion of Users in Social Network Environments, Explaining Scientific and Technical Emergence Forecasting, Social Network Analysis for Biometric Template Protection		

COURSEOUTCOMES Oncompletionofthecourse,students willbeableto	
CO1	Develop semantic web related applications.
CO2	Represent knowledge using ontology.
CO3	Predict human behavior in social web and related communities.
CO4	Visualize social networks.
CO5	Examine social networks analysis using case studies.

TEXTBOOKS

1. Peter Mika, "Social Networks and the Semantic Web", First Edition, Springer 2007.
2. BorkoFurht, "Handbook of Social Network Technologies and Applications", 1st Edition, Springer, 2010.

REFERENCES

1. GuandongXu, Yanchun Zhang and Lin Li, "Web Mining and Social Networking - Techniques and applications", First Edition, Springer, 2011.
2. DionGoh and Schubert Foo, "Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively", IGI Global Snippet, 2008.
3. Max Chevalier, Christine Julien and Chantal Soule-Dupuy, "Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling", IGI Global Snippet, 2009.
4. John G. Breslin, Alexander Passant and Stefan Decker, "The Social Semantic Web", Springer, 2009.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1	1	1	-	-	-	-	-	1
CO2	3	3	2	1	1	1	-	-	-	-	-	1
CO3	3	3	1	1	1	1	-	-	-	-	-	1
CO4	3	3	3	1	1	1	-	-	-	-	-	1
CO5	3	3	2	1	1	1	-	-	-	-	-	1
CO	**3**	**3**	**2**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**1**

YEAR	IV	SEMESTER	VII	L	T	P	C
COURSE CODE /COURSETITLE	BUSINESS INTELLIGENCE			3	0	0	3

COURSEOBJECTIVES

- ✓ To exposed with the basic rudiments of business intelligence system.
- ✓ To study exposed with the basic rudiments of business intelligence system.
- ✓ To understand the business intelligence life cycle and the techniques used in it.
- ✓ To design appropriate different data analysis tools and techniques.

SYLLABUS

UNIT-I	INTRODUCTION	9

What is business intelligence and analytics (BIA)? Evolution of BIA, Interplay among Business Intelligence, Business Analytics, Data Science, Data Mining, Data Analytics, Data Warehousing, Statistics and Machine Learning. Drawing insights from data: DIKW pyramid Business Analytics project methodology - detailed description of each phase, Data exploration and data preparation. Decision Management Systems

UNIT-II	DECISION MANAGEMENT SYSTEM	9

Building Decision Management Systems, Characteristics of Suitable Decisions, Prioritizing Decisions, Decision Analysis, Monitor Decisions, Fact-Based Decisions - The OODA Loop - Technology Enablers, Business Rules Management Systems Data Preprocessing: mechanisms of data collection and challenges involved therein. Notion of data quality.

UNIT-III	NORMALIZATION IN DATA	9

Typical preprocessing operations: combining values into one, handling incomplete or incorrect data, handling missing values, recoding values, sub setting, sorting, transforming scale, determining percentiles, data manipulation, removing noise, removing inconsistencies, transformations, standardizing, normalizing - min-max normalization, z-score standardization, rules of standardizing data Enterprise Reporting.

UNIT-IV	ACCESS DATA	9

Introduction, Types of Data, Enterprise Data Model, Enterprise Subject Area Model, Enterprise Conceptual Model, Enterprise Conceptual Entity Model, Granularity of the Data, Data Reporting and Query Tools, Data Partitioning, Metadata, Total Data Quality Management (TDQM).

UNIT-V	WAREHOUSE AND MODELLING	9

Data Warehousing: What is a data warehouse, need for a data warehouse, architecture, data marts, OLTP vs OLAP, Multidimensional Modeling: Star and snow flake schema, Data cubes, Enterprise Reporting OLAP operations, Data Cube Computation and Data Generalization

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Recall the basic concepts of Business intelligence.
CO2	Review the ooda loop and business rules.
CO3	Apply sorting and data transformation.
CO4	Relate efficient technique in data reporting.
CO5	Formulate star and snow flake schema.

TEXTBOOKS

1. James R Evans, "Business Analytics", Pearson.
2. Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufman, ISBN 978- 81-312-0535-8, 2nd Edition.

REFERENCES

1. "Handbook of Data Mining – for data collection, preparation, quality and visualizing", Wolfgang Jank ,
2. "Business Analytics for managers, exploring and discovering data, Data Modeling", Camm, Cochran, Fry, Ohlmann, Anderson, Sweeney, Williams.
3. "Essentials of Business Analytics" by, Cengage Learning.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	-	-	-	-	1	-	-	1
CO2	3	3	2	2	-	-	-	-	1	-	-	1
CO3	3	3	2	2	-	-	-	-	1	-	-	1
CO4	3	3	2	2	-	-	-	-	1	-	-	1
CO5	3	3	3	2	1	-	-	-	1	-	-	1
CO	**3**	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**1**	**-**	**-**	**1**

YEAR	IV	SEMESTER	VII	L	T	P	C
COURSE CODE /COURSETITLE	PATTERN RECOGNITION			3	0	0	3

COURSEOBJECTIVES

- ✓ To learn the fundamentals of pattern recognition and its relevance to classical and modern problems.
- ✓ To identify, where, when and how pattern recognition can be applied
- ✓ To introduce the most recent applications of pattern recognition techniques.

SYLLABUS

UNIT-I	BAYES DECISION THEORY	9

Minimum-error-rate classification. Classifiers, Discriminant functions, Decision surfaces, Normal density and discriminant functions, Discrete features.

UNIT-II	PARAMETER ESTIMATION METHODS	9

Maximum-Likelihood estimation: Gaussian case. Maximum Posteriori estimation. Bayesianestimation: Gaussian case.Unsupervised learning and clustering - Criterion functions forclustering. Algorithms for clustering: K-Means, Hierarchical and other methods. Clustervalidation. Gaussian mixture models, Expectation-Maximization method for parameterestimation.Maximum entropy estimation.SequentialPattern Recognition, Hidden Markov Models (HMMs), Discrete HMMs, Continuous HMMs, Nonparametric techniques for densityestimation.Parzen-window method. K-Nearest Neighbour method.

UNIT-III	DIMENSIONALITY REDUCTION	9

Principal component analysis – it's relationship to eigen analysis.Fisher discriminant analysis - Generalized Eigen analysis, Eigen vectors/Singular vectors as dictionaries, Factor Analysis, Total variability space – a dictionary learning methods, Non negative matrix factorization - a dictionarylearning method.

UNIT-IV	LINEAR DISCRIMINANT FUNCTIONS	9

Gradient descent procedures, Perceptron, Support vector machines - a brief introduction. Artificial neural networks: Multilayer perceptron – feed forward neural network. A brief introduction to deep neural networks, convolutional neural networks, recurrent neural networks.

UNIT-V	NON-METRIC METHODS FOR PATTERN CLASSIFICATION	9

Non-numeric data or nominal data. Decision trees: Classification and Regression Trees (CART).

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Describe the basic pattern classifier algorithms.
CO2	Explain the various parameter estimation methods.
CO3	Use the dimensionality reduction techniques.
CO4	Analyze the Artificial neural networks and deep neural networks.
CO5	Interpret the recent advancement in pattern recognition.

TEXTBOOKS

1. R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2001
2. S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009
3. C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006

REFERENCES

1. M. Narasimha Murthy, V. Susheela Devi, “Pattern Recognition”, Springer 2011.
2. Menahem Friedman, Abraham Kandel, “Introduction to Pattern Recognition Statistical, Structural, Neural and Fuzzy Logic Approaches”, World Scientific publishing Co. Ltd, 2000.
3. Robert J. Schalkoff, “Pattern Recognition Statistical, Structural and Neural Approaches”, John Wiley and Sons Inc., 1992.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	-	-	-	-	-	-	-	-
CO2	3	3	2	2	-	2	2	2	-	-	-	1
CO3	3	3	2	2	-	-	-	2	-	-	-	1
CO4	3	3	2	2	-	2	2	2	-	-	-	1
CO5	3	3	3	2	2	1	1	-	-	-	-	-
CO	**3**	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**1**

YEAR	IV	SEMESTER	VII	L	T	P	C
COURSE CODE /COURSETITLE	TRUST NETWORKS			3	0	0	3

COURSEOBJECTIVES
✓ To understand trust network. ✓ To learn how decentralization of trust is achieved. ✓ To study the technologies behind crypto currencies. ✓ To impart knowledge in block chain network mining. ✓ To acquire knowledge in emerging concepts using block chain.

SYLLABUS		
UNIT-I	**TRUST NETWORKS**	**9**
Technical and Business Imperatives – Trust Networks to enable the machine economy - Decentralization of Trust – Technologies Block-chain and Crypto currency.		
UNIT-II	**DECENTRALIZATION OF NETWORK**	**9**
Centralization Vs Decentralization – Building Consensus – Distributed Consensus – ConsensusAlgorithm – Consensus without Identity- Incentives and Proof of Work –Forming theDecentralized Network.		
UNIT-III	**BLOCKCHAIN**	**9**
Block-chain the protocol – Types of Block-chain Networks – Design principles of the Blockchaineconomy – Networked Integrity – Distributed power – Value as Incentive – Security and Privacy– Rights and Inclusion – Distributed Ledger – Non- Repudiation.		
UNIT-IV	**CRYPTOCURRENCIES**	**9**
Cryptographic Hash Functions – Cryptography basics and Concepts – Bit-coin – DigitalSignatures as Identities – eWallets – Personal Crypto security – Bit-coin Mining – MiningHardware – Energy Consumption – Mining Pools – Mining Incentives and Strategies.		
UNIT-V	**EMERGING CONCEPTS AND FRAMEWORKS**	**9**
Smart Contracts – Ethereum, Hyperledger, Multi- chain Frameworks – Solidity ProgrammingLanguage – Block-chain with IOT and Cloud.		

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Recall the basics of trusted networks and block-chain technology.
CO2	Build the algorithms for decentralization of networks.
CO3	Interpret and implement block-chain technology.
CO4	Analyze the technologies behind crypto currencies technology.
CO5	Impart knowledge in emerging concepts IOT and Cloud using block-chain.

TEXTBOOKS

- ✓ P.Victor,C.Cornelis,M.Decock "Trust network for recommended system ", Victor Patrica Publishers, 2021.

REFERENCES

1. Don and Alex Tapscott, “Blockchain Revolution”. Portfolio Penguin 2016.
2. William Mougayar, “Business Blockchain Promise, Practice and Application of the Next InternetTechnology, John Wiley & Sons 2016.

CO – PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1	2	1	-	-	-	-	2	2
CO2	3	3	3	-	2	-	-	-	-	-	2	2
CO3	3	3	3	-	2	1	-	-	-	-	2	2
CO4	3	3	3	1	-	1	-	-	-	-	2	2
CO5	3	3	3	1	2	2	2	-	-	-	2	2
CO	**3**	**3**	**3**	**1**	**2**	**1**	-	-	-	-	**2**	**2**

YEAR	IV	SEMESTER	VII	L	T	P	C
COURSE CODE /COURSETITLE	DATA VISUALIZATION			3	0	0	3

COURSEOBJECTIVES

- ✓ To learn how accurately represent voluminous complex data set in web and from other data sources
- ✓ To understand the methodologies used to visualize large data sets
- ✓ To develop the process involved in data visualization and security aspects involved in data visualization

SYLLABUS

UNIT-I	INTRODUCTION	9

Context of data visualization – Definition, Methodology, Visualization design objectives. Key Factors - purpose, visualization function and tone, visualization design options – Data representation, Data presentation, Seven stages of data visualization, widgetsand data visualizationtools.

UNIT-II	VISUALIZING DATA METHODS	9

Mapping - Time series - Connections and correlations – Scatterplot maps - Trees, Hierarchies andRecursion - Networks and Graphs, Info graphics.

UNIT-III	VISUALIZING DATA PROCESS	9

Acquiring data, - Where to Find Data, Tools for Acquiring Data from the Internet, Locating Filesfor Use with processing, Loading Text Data, Dealing with Files and Folders, Listing Files in aFolder, Asynchronous image Downloads, Advanced Web Techniques, Using a Database,Dealing with a Large Number of Files. parsing data - Levels of Effort, Tools for Gathering clues, Text Is Best, Text Markup Languages, Regular expressions (regexps), Grammars andBNF Notation, Compressed Data, Vectors and Geometry, Binary Data formats, Advanced, Detective Work.

UNIT-IV	INTERACTIVE DATA VISUALIZATION	9

Drawing with data – Scales – Axes – Updates, Transition and Motion – Interactivity – Layouts–Geomapping – Exporting, Framework – T3, Js, Tablo.

UNIT-V	SECURITY DATA VISUALIZATION	9

Port scan visualization - Vulnerability assessment and exploitation - Firewall log visualization -Intrusion detection log visualization -Attacking and defending visualization systems – Creatingsecurity visualization System.

COURSEOUTCOMES Oncompletionofthecourse,students willbeableto	
CO1	Define the use various methodologies present in data visualization.
CO2	Design the process involved and security issues present in data visualization.
CO3	Apply appropriate data visualization techniques given particular requirements imposed by the data.
CO4	Implement the layouts for geo-mapping.
CO5	Evaluate appropriate design principles in the creation of presentations and visualizations**.**

TEXTBOOKS

1. Scott Murray, "Interactive data visualization for the web", O"Reilly Media, Inc., 2013.

REFERENCES

4. Ben Fry, "Visualizing Data", O'Reilly Media, Inc., 2007.
5. Greg Conti, "Security Data Visualization: Graphical Techniques for Network Analysis", NoStarch Press Inc, 2007.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	-	-	-	1	-	1	-	-
CO2	3	2	2	1	-	-	-	1	-	1	-	-
CO3	3	2	1	1	-	-	-	1	-	1	-	-
CO4	3	2	1	1	-	-	-	1	-	1	-	-
CO5	3	2	2	1	-	-	-	1	-	1	-	-
CO	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**1**	**-**	**1**	**-**	**-**

YEAR	IV	SEMESTER	VII	L	T	P	C
COURSE CODE /COURSETITLE	ETHICS OF ENGINEERING			3	0	0	3

COURSEOBJECTIVES

- ✓ To enable the students to create an awareness on Engineering Ethics and Human Values,
- ✓ To install Moral and Social Values and Loyalty and to appreciate the rights of others..

SYLLABUS

UNIT-I	EDUCATION AND VALUES	9

Importance of Value Education - Definition, Concept, Classification, Criteria And Sources Of Values - Aims And Objectives Of Value Education -Role And Need For Value Education In The Contemporary Society - Role Of Education In Transformation Of Values In Society - Role Of Parents, Teachers, Society, Peer Group And Mass Media In Fostering Values -Teaching Approaches And Strategies To Inculcate Values Through Curricular And Co-Curricular Activities-Need Of Yoga And Meditation For Professional Education And Stress Management.

UNIT-II	ETHICS, HUMAN VALUES AND PERSONAL DEVELOPMENT	9

Ethics: Morals, Values And Ethics ,Work Ethic, Environmental Ethics, Computer Ethics Code Of Conduct- Human Values: Truthfulness, Constructivity, Sacrifice, Sincerity, Self-Control, Altruism, ScientificVision, Relevancy Of Human Values To Good Life Spirituality-Personal Development :Character Formation Towards Positive Personality -Modern Challenges Of Adolescent: Emotions And Behavior –Self-Analysis And Introspection: Sensitization Towards Gender Equality, Physically Challenged, Intellectually Challenged, Respect To - Age, Experience, Maturity, Family Members, Neighbors, Co-Workers.

UNIT-III	ENGINEERING ETHICS AND MORAL DILEMMAS	9

Need of Engineering Ethics- The code of ethics for engineers – Societies for engineers -NSPE Code of Ethics- Ethical and Unethical practices -Engineering As An Ethical Profession- Ethical Issues Faced By Engineers- Moral Dilemmas - Procedures For Facing Moral Dilemmas- Moral Dilemma Scenarios- Resolving An Moral Dilemma- Solving The Dilemmas In Students Life Case studies – situational decision making

UNIT-IV	VALUE EDUCATION TOWARDS NATIONAL AND GLOBAL DEVELOPMENT	9

Personal values: Self-Strengths, Weaknesses -Professional Values: Knowledge Thirst, Sincerity in Profession, Regularity, Punctuality, Faith- Constitutional Values: Sovereign, Democracy, Socialism, Secularism, Equality, Justice, Liberty, Freedom, Fraternity- Social Values: Pity and Probity, Self-Control, Universal Brotherhood- Religious and Moral Values: Tolerance, Wisdom and Character.

UNIT-V	CODE ETHICS IN SOFTWARE DEVELOPMENT	9

Need A Code Of Ethics For Software Development-Ethics, Values And Practices For SoftwareProfessionals-Ethics In Computing, From Academia To Industry-Principles Of Software Ethics – Rewriting The Code For Ethics In Software Development-Ethics Of Security-Privacy Ethics – Ethics In A Psychological Perspective- Ethical Issues In Software Industry-Issues In Professional Ethics In Software Project Management-Ethical Issues In Information Technology.

COURSEOUTCOMES Oncompletionofthecourse,students willbeableto	
CO1	Define the importance of value education in society.
CO2	Identify the ethics, human values that supports individual growth and their personal development.
CO3	Use Engineering ethics in solving moral dilemma problems.
CO4	Analyze the importance of value education towards national and global development.
CO5	Develop professionals in software industry with idealistic, practical and moral values.

TEXTBOOKS

1. Mike W. Martin and Roland Schinzinger, ―Ethics in Engineering‖, Tata McGraw Hill, NewDelhi,2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, ―Engineering Ethics‖, Prentice Hall ofIndia, New Delhi, 2004.

REFERENCES

1. Govindarajan M, Natarajan‖ S, Senthil Kumar‖ V.S, ‚Engineering Ethics', Prentice Hall Of India, New Delhi, 2004.
2. Monica J. Taylor. Values in Education and Education in Value. Routledge, 1996.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	3	2	3	3	-	-	-
CO2	3	3	3	3	-	2	2	3	3	-	-	-
CO3	3	3	3	3	-	3	1	3	3	-	-	-
CO4	3	3	3	3	-	1	1	3	3	-	-	-
CO5	3	3	3	3	-	2	2	3	3	-	-	-
CO	**3**	**3**	**3**	**3**	-	**2**	**2**	**3**	**3**	-	-	-

YEAR	IV	SEMESTER	VII	L	T	P	C
COURSE CODE /COURSETITLE	DIGITAL IMAGE PROCESSING			3	0	0	3

COURSEOBJECTIVES

- ✓ To become familiar with digital image fundamentals
- ✓ To get exposed to simple image enhancement techniques in Spatial and Frequency domain.
- ✓ To learn concepts of degradation function and restoration techniques.
- ✓ To study the image segmentation and representation techniques.
- ✓ To become familiar with image compression and recognition methods

SYLLABUS

UNIT-I	DIGITAL IMAGE FUNDAMENTALS	9

Steps in Digital Image Processing – Components – Elements of Visual Perception – ImageSensing and acquisition – Image Sampling and Quantization – Relationships between pixels -Color image fundamentals - RGB, HSI models, Two-dimensional mathematical preliminaries,2D transforms - DFT, DCT, Image Restoration - Degradation Model – Noise models - Spatial filtering – Frequency domain filtering.

UNIT-II	IMAGE ENHANCEMENT	9

Spatial Domain: Gray level transformations – Histogram processing – Basics of SpatialFiltering–Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction toFourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworthand Gaussian filters, Homomorphic filtering, Color image enhancement.

UNIT-III	IMAGE RESTORATION	9

Image Restoration - degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering.

UNIT-IV	IMAGE SEGMENTATION	9

Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation–Region growing – Region splitting and merging – Morphological processing- erosion anddilation, Segmentation by morphological watersheds – basic concepts – Dam construction –Watershed segmentation algorithm, Region based segmentation-Morphological processing- erosion and dilation.

UNIT-V	IMAGE COMPRESSION AND RECOGNITION	9

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding,JPEG Standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor,Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes – Recognition based on matching, Edge linking - Thresholding – Region based segmentation - Morphology.

COURSEOUTCOMES Oncompletionofthecourse,students willbeableto	
CO1	Define the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms.
CO2	Analyze the images using the techniques of smoothing, sharpening and enhancement.
CO3	Design the restoration concepts and filtering techniques.
CO4	Apply the basics of segmentation, features extraction, compression and recognition methods for color models.
CO5	Use data compression techniques and topological features.

TEXTBO OKS

- ✓ Rafael C. Gonzalez, Richard E. Woods, _Digital Image Processing‘, Pearson, Third Edition,2010.
- ✓ Anil K. Jain, Fundamentals of Digital Image Processing‘, Pearson, 2002.

REFERENCES

1. Kenneth R. Castleman, “Digital Image Processing”, Pearson, 2006.
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, “Digital Image Processing usingMATLAB”, Pearson Education, Inc., 2011.
3. D,E. Dudgeon and RM. Mersereau, “Multidimensional Digital Signal Processing”, PrenticeHall Professional Technical Reference, 1990.
4. William K. Pratt, “Digital Image Processing‘, John Wiley, New York, 2002.
5. Milan Sonka et al, “Image processing, analysis and machine vision‘, Brookes/Cole, VikasPublishing House, 2nd edition, 1999.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	-	-	-	-	-	1
CO2	3	3	3	3	-	-	-	-	-	-	-	1
CO3	3	3	3	3	-	-	-	-	-	-	-	1
CO4	3	3	3	3	-	-	-	-	-	-	-	1
CO5	3	3	3	3	-	-	-	-	-	-	-	1
CO	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

YEAR	IV	SEMESTER	VII	L	T	P	C
COURSE CODE /COURSETITLE	GAME PROGRAMMING			3	0	0	3

COURSEOBJECTIVES

- ✓ Describe the concepts of models of a 3D graphics.
- ✓ Explain the various principles in game design.
- ✓ Compose the concepts of Hardware and Software Renderers.
- ✓ Identify the various gaming platforms and frameworks.
- ✓ Recognize the gaming interface using 2d and 3d.

SYLLABUS

UNIT-I	3D GRAPHICS FOR GAME PROGRAMMING	9

Coordinate Systems, Ray Tracing, Modeling in Game Production, Vertex Processing,Rasterization, Fragment Processing and Output Merging, Illumination and Shaders, ParametricCurves and Surfaces, Shader Models, Image Texturing, Bump Mapping, Advanced Texturing,Character Animation, Physics-based Simulation.

UNIT-II	GAME DESIGN PRINCIPLES	9

Character development, Story Telling, Narration, Game Balancing, Core mechanics, Principlesof level design, Genres of Games, Collision Detection, Game Logic, Game AI, Path Finding.

UNIT-III	GAMING ENGINE DESIGN	9

Renderers, Software Rendering, Hardware Rendering, and Controller based animation, SpatialSorting, Level of detail, collision detection, standard objects, and physics

UNIT-IV	GAMING PLATFORMS AND FRAMEWORKS	9

Flash, DirectX, OpenGL, Java, Python, XNA with Visual Studio, Mobile Gaming for theAndroid, iOS, Game engines - Adventure Game Studio, DXStudio, Unity.

UNIT-V	GAME DEVELOPMENT	9

Developing 2D and 3D interactive games using OpenGL, DirectX – Isometric and Tile BasedGames, Puzzle games, Single Player games, Multi Player games.

COURSEOUTCOMES Oncompletionofthecourse,students willbeableto	
CO1	Discuss the fundamental concepts of 3D.
CO2	Summarize the design principles in gaming.
CO3	Illustrate the Renderers of hardware and software.
CO4	Explore the various gaming platforms and frameworks.
CO5	Use OpenGL to create new gaming interface.

TEXTBOOKS

1. David H. Eberly, "3D Game Engine Design, Second Edition: A Practical Approach to Real-
2. Time Computer Graphics" Morgan Kaufmann, 2 Edition, 2006.
3. JungHyun Han, "3D Graphics for Game Programming", Chapman and Hall/CRC, 1st edition, 2011.
4. Mike McShaffrfy, "Game Coding Complete", Third Edition, Charles River Media, 2009.
5. Jonathan S. Harbour, "Beginning Game Programming", Course Technology PTR, 3 edition, 2009.

REFERENCES

1. Ernest Adams and Andrew Rollings, "Fundamentals of Game Design", Prentice Hall 1st edition, 2006.
2. Roger E. Pedersen, "Game Design Foundations", Edition 2, Jones & Bartlett Learning, 2009.
3. Scott Rogers, "Level Up!: The Guide to Great Video Game Design", Wiley, 1st edition, 2010.
4. Jason Gregory, "Game Engine Architecture", A K Peters, 2009.
5. Jeannie Novak, "Game Development Essentials", 3rd Edition, Delmar Cengage Learning,
6. 2011.
7. Andy Harris, "Beginning Flash Game Programming For Dummies", For Dummies; Updated edition, 2005.
8. John Hattan, "Beginning Game Programming: A GameDev.net Collection", CourseTechnology PTR, 1 edition, 2009.
9. Eric Lengyel, "Mathematics for 3D Game Programming and Computer Graphics", Third
10. Edition, Course Technology PTR, 3rd edition, 2011.
11. Dino Dini, "Essential 3D Game Programming", Morgan Kaufmann, 1st edition 2012.
12. Jim Thompson, Barnaby Berbank-Green, and Nic Cusworth, "Game Design: Principles,
13. Practice, and Techniques - The Ultimate Guide for the Aspiring Game Designer", 1 st edition, Wiley, 2007.

CO- PO MAPPING												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1	1	1	-	-	-	-	-	-	-
CO2	3	2	2	1	1	-	1	-	-	-	-	-
CO3	3	3	2	1	1	-	1	-	-	-	-	-
CO4	3	3	3	2	2	1	1	-	-	-	1	-
CO5	3	3	3	2	2	2	1	-	1	1	1	-
CO	**3**	**3**	**2**	**2**	**2**	**2**	**1**	**-**	**1**	**1**	**1**	**-**

YEAR	IV	SEMESTER	VII	L	T	P	C
COURSE CODE /COURSETITLE	SOFTWARE PROJECT MANAGEMENT			3	0	0	3

COURSEOBJECTIVES

- ✓ Understand the Software Project Planning and Evaluation techniques.
- ✓ To plan and manage projects at each stage of the software development life cycle (SDLC).
- ✓ To learn about the activity planning and risk management principles.
- ✓ To manage software projects and control software deliverables.
- ✓ To develop skills to manage the various phases involved in project management and people management.
- ✓ To deliver successful software projects that support organization‘s strategic goals.

SYLLABUS

UNIT-I	PROJECT EVALUATION AND PROJECT PLANNING	9

Importance of Software Project Management – Activities - Methodologies – Categorization ofSoftware Projects – Setting objectives – Management Principles – Management Control –Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategicprogram Management – Stepwise Project Planning.

UNIT-II	PROJECT LIFE CYCLE AND EFFORT ESTIMATION	9

Software process and Process Models – Choice of Process models - Rapid Applicationdevelopment – Agile methods – Dynamic System Development Method – ExtremeProgramming– Managing interactive processes – Basics of Software estimation – Effort and Costestimation techniques – COSMIC Full function points –COCOMO II - a Parametric ProductivityModel.

UNIT-III	ACTIVITY PLANNING AND RISK MANAGEMENT	9

Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling –Network Planning models – Formulating Network Model – Forward Pass & Backward Passtechniques – Critical path (CRM) method – Risk identification – Assessment – Risk Planning –Risk Management – PERT technique – Monte Carlo simulation – Resource Allocation –Creation of critical paths – Cost schedules.

UNIT-IV	PROJECT MANAGEMENT AND CONTROL	9

Framework for Management and control – Collection of data – Visualizing progress – Costmonitoring – Earned Value Analysis – Prioritizing Monitoring – Project tracking – Changecontrol – Software Configuration Management – Managing contracts – Contract Management.

UNIT-V	STAFFING IN SOFTWARE PROJECTS	9

Managing people – Organizational behavior – Best methods of staff selection – Motivation – TheOldham – Hackman job characteristic model – Stress – Health and Safety – Ethical andProfessional concerns – Working in teams – Decision making – Organizational structures –Dispersed and Virtual teams – Communications genres – Communication plans – Leadership.

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COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Recognize Project management principles while developing the Software.
CO2	Classify and estimate the projects based on various project life cycles.
CO3	Demonstrate Activity Planning Schedules and Manage Risks.
CO4	Analyze and control the project management approaches.
CO5	Formulate in managing people and organizing teams.

TEXTBOOKS

- ✓ Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition,Tata McGraw Hill, New Delhi, 2012.

REFERENCES

1. Robert K. Wysocki "Effective Software Project Management – Wiley Publication, 2011.
2. Walker Royce: "Software Project Management"- Addison-Wesley, 1998.
3. Gopalaswamy Ramesh, "Managing Global Software Projects" – McGraw Hill Education(India), Fourteenth Reprint 2013.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	-	2	-	2	2	2	2	2
CO2	3	3	3	3	2	2	-	3	3	3	3	3
CO3	3	3	3	3	3	3	-	3	3	3	3	3
CO4	3	3	3	3	3	2	-	3	3	3	3	2
CO5	3	3	3	3	3	3	-	3	3	3	3	3
CO	**3**	**3**	**3**	**3**	**3**	**3**	**-**	**3**	**3**	**3**	**3**	**3**

YEAR	IV	SEMESTER	VIII	L	T	P	C
COURSE CODE /COURSETITLE	HUMAN COMPUTER INTERACTION			3	0	0	3

COURSEOBJECTIVES

- ✓ Define the foundations of Human Computer Interaction.
- ✓ Organize the design technologies for individuals and persons with disabilities.
- ✓ Identify the issues and models of HCI.
- ✓ Summarize the concepts of mobile HCI.
- ✓ Recognize the guidelines for user interface.

SYLLABUS

UNIT-I	FOUNDATIONS OF HCI	9

The Human: I/O channels – Memory – Reasoning and problem solving; The Computer:Devices – Memory – processing and networks; Interaction: Models – frameworks –Ergonomics – styles – elements – Interactivity- Paradigms. - Case Studies.

UNIT-II	DESIGN & SOFTWARE PROCESS	9

Interactive Design: Basics, process, scenarios, navigation, screen design, Iteration and prototyping. HCI in software process: The software life cycle Usability engineering Iterative design and prototyping Design Focus: Prototyping in practice Design rationale Design rules Principles to support usability Standards Golden rules and heuristics HCI patterns Evaluation techniques, Goals of evaluation, Evaluation through expert analysis, Evaluation through user participation, Choosing an evaluation method. Universal design, Universal design principles Multi-modal interaction.

UNIT-III	MODELS AND THEORIES	9

HCI Models: Cognitive models: Goal and task hierarchies Design Focus: GOMS saves money Linguistic Models The challenge of display-based systems Physical and device models Cognitive architectures Ubiquitous computing and augmented realities. Socio- Organizational issues and stakeholder requirements, Communication and collaboration models, Hypertext, Multimedia and WWW.

UNIT-IV	MOBILE HCI	9

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications:Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design:Elements of Mobile Design, Tools. - Case Studies.

UNIT-V	WEB INTERFACE DESIGN	9

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays,Inlays and Virtual Pages, Process Flow - Case Studies

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Summarize effective dialog for HCI.
CO2	Design effective HCI for individuals and persons with disabilities.
CO3	Illustrate the importance of user feedback.
CO4	Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
CO5	Develop meaningful user interface.

TEXTBO OKS

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, ―Human Computer Interaction‖,3rd Edition, Pearson Education, 2004.
2. Brian Fling, ―Mobile Design and Development‖, First Edition, O‘Reilly Media Inc., 2009.
3. Bill Scott and Theresa Neil, ―Designing Web Interfaces‖, First Edition, O‘Reilly, 2009.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	1	1	1	-	-	2	2
CO2	3	3	2	2	2	2	1	-	1	-	2	1
CO3	3	3	3	2	2	-	-	-	1	-	2	2
CO4	3	3	3	2	2	-	-	-	-	-	2	2
CO5	3	3	3	2	2	2	-	-	-	-	2	2
CO	3	3	3	2	2	2	1	1	1	-	2	2

YEAR	IV	SEMESTER	VIII	L	T	P	C
COURSE CODE /COURSETITLE	SOFTWARE ORIENTED ARCHITECTURE			3	0	0	3

COURSEOBJECTIVES
✓ Define fundamentals of XML. ✓ Summarize the overview of Service Oriented Architecture and Web services and their importance. ✓ Analyze the web services standards and technologies. ✓ Learn service oriented analysis and design for developing SOA based applications.

SYLLABUS		
UNIT-I	**XML**	**9**
XML document structure – Well-formed and valid documents – DTD – XML Schema –Parsing XML using DOM, SAX – XPath - XML Transformation and XSL – Xquery.		
UNIT-II	**SERVICE ORIENTED ARCHITECTURE (SOA) BASICS**	**9**
Characteristics of SOA, Benefits of SOA , Comparing SOA with Client-Server andDistributed architectures – Principles of Service Orientation – Service layers.		
UNIT-III	**WEB SERVICES (WS) AND STANDARDS**	**9**
Characteristics of SOA, Benefits of SOA , Comparing SOA with Client-Server andDistributed architectures – Principles of Service Orientation – Service layers.		
UNIT-IV	**WEB SERVICES EXTENSIONS**	**9**
WS-Addressing - WS-ReliableMessaging - WS-Policy – WS-Coordination – WS -Transactions -WS-Security – Examples.		
UNIT-V	**SERVICE ORIENTED ANALYSIS AND DESIGN**	**9**
SOA delivery strategies – Service oriented analysis – Service Modelling – Service orienteddesign – Standards and composition guidelines -- Service design – Business process design –Case Study.		

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Define fundamental of XML technologies.
CO2	Summarize the overview of Service Oriented Architecture and Web services and their importance.
CO3	Analyze the web services standards and technologies.
CO4	Use web services extensions to develop solutions.
CO5	Apply service modeling, service oriented analysis and design for application development.

TEXTBOOKS

1. Thomas Erl, - Service Oriented Architecture: Concepts, Technology, and Design,Pearson Education, 2005.
2. Sandeep Chatterjee and James Webber, - "Developing Enterprise Web Services: An Architect #39 Guide", Prentice Hall, 2004

REFERENCES

1. James McGovern, Sameer Tyagi, Michael E Stevens, Sunil Mathew, ―Java Web ServicesArchitecture‖, Elsevier, 2003.
2. Ron Schmelzer et al. ― XML and Web Services‖, Pearson Education, 2002.
3. Frank P.Coyle, ―XML, Web Services and the Data Revolution‖, Pearson Education,2002.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1	1	-	1	-	1	-	-	1
CO2	3	2	2	1	1	-	1	-	1	-	-	1
CO3	3	3	1	1	1	-	1	-	1	-	-	1
CO4	3	2	3	1	1	-	1	-	1	-	-	1
CO5	3	3	2	1	1	-	1	-	1	-	-	1
CO	**3**	**3**	**2**	**1**	**1**	**-**	**1**	**-**	**1**	**-**	**-**	**1**

YEAR	IV	SEMESTER	VIII	L	T	P	C
COURSE CODE /COURSETITLE	AI FOR CLINICAL INFORMATION SYSTEM			3	0	0	3

COURSEOBJECTIVES
✓ To exposed with the basic rudiments of business intelligence system. ✓ To study exposed with the basic rudiments of business intelligence system. ✓ To understand the business intelligence life cycle and the techniques used in it. ✓ To design appropriate different data analysis tools and techniques.

SYLLABUS		
UNIT-I	**INTELLIGENT AGENTS IN AI**	**9**
Introduction to AI – Agents and Environments – concept of rationality – nature of environments – structure of agents Problem solving agents – search algorithms – uninformed search strategies-clinic information system-applications of AI in CIS.		
UNIT-II	**FUNDAMENTALS OF DATA SCIENCE**	**9**
Need for data science – benefits and uses – facets of data – data science process – setting the research goal – retrieving data – cleansing, integrating, and transforming data – exploratory data analysis – build the models – presenting and building applications.		
UNIT-III	**DESCRIBING DATA**	**9**
Frequency distributions – Outliers – relative frequency distributions – cumulative frequency distributions – frequency distributions for nominal data – interpreting distributions – graphs – averages – mode – median – mean – averages for qualitative and ranked data – describing variability Tentative – range – variance – standard deviation – degrees of freedom – interquartile range – variability for qualitative and ranked data.		
UNIT-IV	**CLINICAL INFORMATION SYSTEM**	**9**
Overview-clinical advanced support - electronic medical records(EMR) - training and search - key players in choosing CIS - implement and revising the CIS - Component of HER - clinical decision making – tools application of AI in CIS.		
UNIT-V	**KNOWLEDGE REPRESENTATION AND PLANNING**	**9**
Ontological engineering – categories and objects – events – mental objects and modal logic – reasoning systems for categories – reasoning with default information Classical planning – algorithms for classical planning – heuristics for planning – hierarchical planning – non-deterministic domains – time, schedule and resources – analysis.		

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Explain autonomous agents that make effective decisions in fully informed, partially observable, and adversarial settings.
CO2	Choose appropriate algorithms for solving given AI problems.
CO3	Design and implement logical reasoning agents.
CO4	Apply and implement agents that can reason under uncertainty.
CO5	Analyze the planning models support for CIS.

TEXTBOOKS

- ✓ Stuart Russel and Peter Norvig, "Artificial Intelligence: A Modern Approach", Fourth Edition, Pearson Education, 2020.

REFERENCES

- ✓ Shickel B, Tighe PJ, Bihorac A, Rashidi P. "Deep EHR: A survey of recent advances in deep learning techniques for electronic health record (EHR) analysis". IEEE J Biomed Health Inform. (2018) 22:1589–604. doi: 10.1109/JBHI.2017.2767063.

CO- PO MAPPING

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CO2	3	3	2	2	-	-	-	-	1	-	-	1
CO3	3	3	2	-	-	-	-	-	1	-	-	1
CO4	3	2	2	2	-	-	-	-	1	-	-	1
CO5	3	2	3	1	1	-	-	-	1	-	-	1
CO	**3**	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**1**	**-**	**-**	**1**

YEAR	IV	SEMESTER	VIII	L	T	P	C
COURSE CODE /COURSETITLE	NATURAL LANGUAGE PROCESSING			3	0	0	3

COURSEOBJECTIVES

- ✓ To learn the fundamentals of natural language processing
- ✓ To understand the use of CFG and PCFG in NLP
- ✓ To understand the role of semantics of sentences and pragmatics
- ✓ To apply the NLP techniques to IR applications

SYLLABUS

UNIT-I	INTRODUCTION	9

Origins and challenges of NLP - Language Modeling: Grammar -based LM, Statistical LM -Regular expressions, Finite-State Automata -Non-deterministic Finite Automation (NDFA) - English morphology, Types of morphemes – morphotactic – orthographic rules - Transducers for lexiconand rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.

UNIT-II	WORD LEVEL ANALYSIS	9

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – WordClasses, Part-of -Speech Tagging, Rule-based, Stochastic and Transformation-based tagging,Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT-III	SYNTACTIC ANALYSIS	9

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar– Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing –Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs -Feature structures, Unification of feature structures.

UNIT-IV	SEMANTICS AND PRAGMATICS	9

Requirements for representation, First-Order Logic, Description Logics – Syntax-DrivenSemanticanalysis, Semantic attachments – Word Senses, Relations between Senses,Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD usingSupervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity usingThesaurus and Distributional methods.

UNIT-V	DISCOURSE ANALYSIS AND LEXICAL RESOURCES	9

Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution usingHobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer,Lemmatizer, Penn Treebank, Brill Tagger, WordNet, PropBank, FrameNet, Brown Corpus,British National Corpus (BNC).

COURSEOUTCOMES Oncompletionofthecourse,students willbeableto	
CO1	Learn the given text with basic Language features.
CO2	Understand the use of different statistical approaches for different types of NLP applications.
CO3	Apply a rule based system to tackle morphology/syntax of a language.
CO4	Analyze a tag set to be used for statistical processing for real-time applications.
CO5	Design an innovative application using NLP components.

TEXTBOOKS

- ✓ Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language processing, Computational Linguistics and Speech, Pearson Publication, 2014.
- ✓ Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python‖, First Edition, O_Reilly Media, 2009.

REFERENCES

1. Breck Baldwin, ”Language processing with Java” and LingPipe Cookbook, AtlanticPublisher, 2015.
2. Richard M Reese, “Natural Language Processing with Java”, O_Reilly Media, 2015.
3. Nitin Indurkhya and Fred J. Damerau, —Handbook of Natural Language Processing, second Edition, Chapman and Hall/CRC Press, 2010.
4. Tanveer Siddiqui, U.S. Tiwary, —Natural Language Processing and InformationRetrieval, Oxford University Press, 2008.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	-	-	-	-	1	1	-	-
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CO3	3	3	2	1	-	-	-	-	1	1	-	-
CO4	3	2	3	2	-	-	-	-	1	1	-	-
CO5	3	3	2	1	-	-	-	-	1	1	-	-
CO	**3**	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**1**	**1**	**-**	**-**

YEAR	IV	SEMESTER	VIII	L	T	P	C
COURSE CODE /COURSETITLE	ROBOTICS			3	0	0	3

COURSEOBJECTIVES
✓ The objective of this course is to import knowledge about industrial robots for their control and design. ✓ To study the use of various types of End of Effectors and Sensors ✓ To impart knowledge in Robot Kinematics and Programming ✓ To learn Robot safety issues and economics.

SYLLABUS		
UNIT-I	**INTRODUCTION TO ROBOTICS**	**9**
Types and components of a robot, Classification of robots, closed-loop and open- loop control systems. Kinematics systems; Definition of mechanisms and manipulators, Social issues and safety.		
UNIT-II	**ROBOT KINEMATICS AND DYNAMICS**	**9**
Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, DH parameters, Jacobian, Singularity, and Statics Dynamic Modelling: Equations of motion: Euler-Lagrange formulation		
UNIT-III	**SENSORS AND VISION SYSTEM**	**9**
Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc. Introduction to Cameras, Camera calibration, Geometry of Image formation, Euclidean/ Similarity/ Affine/ Projective transformations Vision applications in robotics.		
UNIT-IV	**ROBOT CONTROL**	**9**
Basics of control: Transfer functions, Control laws: P, PD, PID Non-linear and advancedcontrols.		
UNIT-V	**ROBOT ACTUATION SYSTEMS**	**9**
Actuators: Electric, Hydraulic and Pneumatic; Transmission: Gears, Timing Belts andBearings, Parametersfor selection of actuators. Control Hardware and Interfacing: Embeddedsystems: Architecture and integrationwith sensors, actuators, components, Programming forRobot Applications.		

COURSEOUTCOMES	
Oncompletionofthecourse,students willbeableto	
CO1	Remember kinematic and dynamic analyses with simulation.
CO2	Design control laws for a robot.
CO3	Apply the Integrate mechanical and electrical hardware for a real prototype of robotic device.
CO4	Analyze a robotic system for given application.
CO5	Evaluate and develop application-based Robots.

TEXTBOOKS

1. Saha, S.K., "Introduction to Robotics", 2nd Edition, McGraw-Hill Higher Education, NewDelhi, 2014.
2. Ghosal. A., "Robotics", Oxford, New Delhi, 2006.

REFERENCES

1. Craig J.J., "Introduction to Robotics Mechanics and Control", Pearson Education, 2008.
2. Deb S.R., "Robotics Technology and Flexible Automation", Tata McGraw Hill Book Co., 1994.
3. Koren Y., "Robotics for Engineers", Mc Graw Hill Book Co., 1992.

CO- PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	-	-	-	-	2	-	-	2
CO2	3	2	1	1	1	-	-	-	2	-	-	2
CO3	3	2	1	1	1	-	-	-	1	1	2	2
CO4	3	2	2	2	1	1	2	2	1	1	2	2
CO5	3	2	2	2	1	1	1	1	2	1	2	2
CO	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**