BAPATLAENGINEERINGCOLLEGE::BAPATLA
(Autonomous)

SCHEMEOFINSTRUCTION&EXAMINATION(SemesterSystem)
For
ElectronicsandCommunicationsEngineering
Effective from the Academic Year 2020-2021 (R20 Regulations)
FourthYearB. Tech (SEMESTER– VII)

		Subject	Scheme ofInstruction(Periodsperweek)				Scheme ofExamination(Maximummarks)			No. ofCredits
			L	T	P	Total	CIE	SEE	Total Marks	
20ECD31, …34	PC	ProfessionalElective-III	3	0	0	3	30	70	100	3
20ECD41, …44	PC	ProfessionalElective-IV	3	0	0	3	30	70	100	3
20EC703	PC	ProfessionalElective-V	3	0	0	3	30	70	100	3
20ECJ31, …34	JOE	Open/Job-OrientedElective-III	3	0	0	3	30	70	100	3
20ECD21,..,14	JOE	Open/Job OrientedElective-IV	3	0	0	3	30	70	100	3
20EC704/HS02	HSS	IndustrialManagement andEntrepreneurship Development	3	0	0	3	30	70	100	3
20EC705/SO03	SOC	Artificialneuralnetworks	1	0	2	3	30	70	100	2
		Industrial/ResearchInternship2Months(Mandatory)afterthirdyear(to beevaluated duringVIIIsemester)								3
		TOTAL	19	0	2	21	210	490	700	23
	Honors/Minorcourses(Thehoursdistributioncanbe3-0-2or3-1-0also)									4

CIE:Continuous InternalEvaluation SEE:SemesterEndExaminationL:Lecture, T: Tutorial, P: Practical
BS:BasicScienceCourses ES:EngineeringScienceCourses PC:Professional Core

PEC Elective-III:
20ECD31: RADAREngineering
20ECD32: Speech Processing
20ECD33: FPGADesign
20ECD34: MEMS

Elective-IV:
20ECD41: SatelliteCommunication
20ECD42: Wireless Networks
20ECD43: Advanced DSP
20ECD44: CloudComputing

ProfessionalElective:V
20ECD51: LowPowerVLSI
20ECD52:AdvancedWirelessCommunication
20ECD53: Semiconductor Device Modeling
20ECD54:Advanced Sensors
20ECD55: 20ECD55 - System On Chip Architecture
Open/JOC-Elective III
20ECI01Digital Image Processing
20ECI02EmbeddedSystem&Design
JOCElective-IV
20ECJ41: Digital Image Processing
20ECJ42: Biomedical Signal Processing
20ECJ43: Robotics
20ECJ44: DeepLearning

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SCHEMEOFINSTRUCTION&EXAMINATION(SemesterSystem)
For
ElectronicsandCommunicationsEngineering
Effective from the Academic Year 2020-2021 (R20 Regulations)
FourthYearB. Tech (SEMESTER– VIII)

Code		Subject	Scheme ofInstruction(Periodsperwe ek)				SchemeofExamination(Maximummarks)			No. ofCredits
			L	T	P	Total	CIE	SEE	TotalMarks	
20ECP 801	PC	Project work,Seminarandinternshipin Industry	-	-	-	3	30	70	100	12

BAPATLAENGINEERINGCOLLEGE::BAPATLA
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RADAR Engineering -Professional Elective- III

IVB. Tech– ISemester(20ECD31)

Lectures	3	Tutorial	0	Practical	0	Credits	3
ContinuousInternalAssessment	:	30	SemesterEndExamination(3Hours)	:	70		

Prerequisites:EMWavesandTransmissionLines, Antennasand wavePropagation.

CourseObjectives: To learn
CO1: Tounderstandthe basicconceptsofRadar communications systemanditsapplications.
CO2: ToknowtheworkingprinciplesofCW,FM,MTIandPulseDopplerradars.
CO3: To understand the working principles of Tracking Radars and Radar receivers.
CO4: TounderstandbasicconceptsofElectronic warfare and other types of Radars.
CourseOutcomes: Studentswill beable to
CLO1: UnderstandthebasicconceptsofRadarcommunicationssystemanditsapplications.
CLO2: Know the working principles of CW, FM, MTI and Pulse Doppler radars.
CLO3: Understand the working principles of Tracking Radars and Radar receivers.
CLO4: Knowthebasic concepts of Electronic warfare and other types of Radars.

SYLLABUS

UNIT – I

Introduction to RADAR: The simple form of the Radar equation, Radar Block Diagram and operation, Applications of RADAR, Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Signal to Noise Ratio, Integration of Radar pulses, Radar Cross Section of Targets, Cross Section Fluctuations, Transmitter Power, Pulse Repetition Frequency And Range Ambiguities, Antenna Parameters, System Losses.

UNIT – II

CW and Frequency Modulated RADAR: The Doppler Effect, CW Radar, Frequency Modulated CW Radar, Multiple Frequency CW Radar.

MTI and Pulse Doppler radar: Introduction, Block Diagrams of MTI Radar Delay line cancellers, Multiple or Staggered Pulse Repetition Frequencies, Range Gated Doppler Filters.

UNIT – III

Tracking Radar: Tracking with Radar, Sequential lobbing, conical scan, Monopulse Tracking RADARS (amplitude comparison and phase comparison).

RADAR Receivers, Displays, And Duplexers: The RADAR Receiver, Noise Figure, Mixers, Low Noise front Ends, Displays, Duplexers and Receiver Protectors, Radome.

UNIT – IV

Electronic Warfare: Electronic counter measures and Electronic counter-counter measures, Introduction, Electronic counter measures, RADAR jamming, Electronic counter-counter measures, Electronic Support, Stealth applications.

Other Radar Topics: HF Over-the-Horizon Radar, Air-Surveillance Radar, Height Finder and 3D Radars, Bistatic Radar.

TEXTBOOKS:

1. IntroductiontoRadarSystems, Merrill ISkolnik,2ndEdition,TMH,2007.
2. Fundamentals of RADAR, sonar and Navigation Engineering, KK Sharma, SK Kataria&Sons,FourthEdition, 2014.

REFERENCEBOOKS:

1. MicrowaveandRadarEngineeringbyDr.M.Kulkarni",UmeshPublications,fifthedition NewDelhi,2009.
2. MicrowaveandRadarEngineering",byGottapuSasiBhushanaRao,PearsonPublications, 2014.

BAPATLAENGINEERINGCOLLEGE::BAPATLA
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SpeechProcessing-ProfessionalElective-III
IVB. Tech–I Semester(20ECD32)

Lectures	3	Tutorial	0		Practical	0	Credits	3			
ContinuousInternalAssessment			:	30	SemesterEndExamination(3Hours)			:	70		

Prerequisites:None

CourseObjectives: Inthis course,students will
CO-1: Learnaboutspeechproductionanditsparameters**.**
CO-2: Analyze speechsignalsmathematically.
CO-3: Understandspeech enhancementand speechto textconversion.
CO-4: Discusstheconceptsofspeechquantizationandcoding.

CourseOutcomes: Studentswillbe able to
CLO-1: Know the fundamentals of speech signal production**.**
CLO-2: Performmathematicalanalysisonspeechsignals.
CLO-3: Learndifferentspeechenhancementtechniquesandevaluatethesimilarities.
CLO-4: Understandthe functioningofspeech quantizersandexecutionofcoding.

UNIT– I

Introduction–SignalandLinearSystems,Frequencyanalysis,Discrete-timesignalsandsystems,filters. Speech production and acoustic phonetics – Anatomy and physiology of speech organs,articulatory phonetics, acoustic phonetics. Short-time speech analysis – windowing, spectra ofwindows, signal – analysis in time domain, short time energy, magnitude, zero-crossing rate andautocorrelation function,

UNIT– II

Linear predictive coding (LPC) analysis – Basic principles, computation of LP coefficients,spectralestimation,windowconsiderations,emphasizinglowfrequencies,pole-zeroLPCmodels.Cepstralanalysis–Mathematicaldetails,applicationsofthecepstrum,pitchestimationusingtime domain and short-time spectral techniques.

UNIT– III

Speech enhancement – Nature of interfering sounds, speech enhancement techniques, spectralsubtraction,enhancementbyresynthesis.Automaticspeechrecognition–Basicpatternrecognitionapproaches,parametric representation ofspeech,evaluatingthe similarityof speechpatterns.

UNIT– IV

Speech quantization and coding-Uniform and Non-Uniform Quantizers and Coder, CompandedQuantizers, Uniform Quantization of Non-uniform Sources: Adaptive Quantizers, WaveformCoding of Speech, Comparison of Different Waveform Coding Techniques, Parametric SpeechCodingTechniques.

TEXT BOOKS:

1. Douglas O Shaughnessy, Speech Communications, second Edition, Oxford UniversityPress,2000.
2. L.RRabinerandS.W.Schafer.DigitalProcessingofspeechsignals,PrenticeHall.

REFERENCEBOOKS:

1. Owens,SignalProcessingofSpeech.
2. DellarandProakis,DigitalSignalProcessing,PHI.
3. Dr.ShailaD.Apte, SpeechandAudioProcessing,WileyIndia Edition.

BAPATLAENGINEERINGCOLLEGE::BAPATLA
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FPGA Design-Professional Elective- III
IVB.Tech–I Semester(20ECD33)

Lectures	3	Tutorial	0	Practical	0	Credits	3
ContinuousInternalAssessment	:	30	SemesterEndExamination(3Hours)			:	70

Prerequisites: None

CourseObjectives: Tolearn
CO1:VLSIcircuitdesignprocesses.
CO2: PhysicalDesignAutomationconceptsand designingArithmeticBuildingBlocks.
CO3: Tohaveanoverview ofdifferent typesofFPGAboards.
CO4: To knowthe process of Synthesis and Testabilityof different buildingblocks.

CourseOutcomes: Students willbe ableto
CLO1: Implement circuit through various design styles (semi-Custom, Full-Custom).**CLO2**: IllustratethefeaturesofProgrammableLogicDevices,CPLD,and performance.**CLO3**: Summarizethe variousFPGAarchitectures, programmableinterconnects.
CLO4: Account forthesyntax and behaviorof theVHDLlanguage.

SYLLABUS

UNITI

Programmable Logic Devices and VLSI Design styles: Read only memory, Programmable LogicArray, Programmable Array Logic, Design styles - Design Styles, Full-Custom, Standard Cell,GateArrays,FieldProgrammableGateArrays,SeaofGates,andComparisonofDifferentDesignStyles.

UNITII

Physical Design Automation of FPGAs: FPGA Technologies, Physical Design Cycle for FPGAs,Partitioning Routing-Routing Algorithm for the Non-Segmented Model, Routing Algorithms fortheSegmented Model Basic Algorithm, RoutingAlgorithm forStaggeredModel.

UNITIII

Field-ProgrammableGateArrays:HardwareDescriptionLanguages,FPGABoardsandSoftwareTools, Transistor as a Switch, FPGA Building Blocks, Layout of the Xilinx Artix-7. XC7A35TFPGA, Interconnect Resources of FPGA, Clock Management, The XADC Block, High-SpeedSerialI/O Transceivers, Peripheral Component Interconnect ExpressInterface, FPGA-BasedDigital System Design Philosophy, Advantages and Disadvantages of FPGAs, Usage Areas ofFPGAs.

UNIT-IV

VHDL Synthesis: VHDL Synthesis, Circuit Design Flow, Circuit Synthesis, Simulation, Layout,Designcapturetools,DesignVerificationTools.TestandTestability:Fault-modelingandsimulation,test generation,design fortestability,Built-in-Self-Test(BIST).

TEXTBOOKS:

1. CemUnsalan,BoraTar“DigitalSystemDesign withFPGAImplementationUsingVerilogandVHDL”McGraw-Hill Education, 2017.
2. N.A.SherwaniVLSIPhysical DesignAutomation.

REFERENCEBOOKS:

1. WesteandEshraghian,“PrinciplesofCMOSVLSIDesign”,PearsonEducation,1999.
2. WayneWolf,“ModernVLSIDesign”,Pearson Education,3rd Edition,1997.
3. JohnM.Rabaey,“Digital IntegratedCircuits”, PHI,EEE,1997.
4. KamranEshraghian,DouglasandA.Pucknell,“EssentialsofVLSIcircuitsandsystems”,PHI,2013 Edition.

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MEMS -Professional Elective- III
IVB.Tech–ISemester(20ECD34)

Lectures	3	Tutorial	0		Practical	0	Credits	3			
ContinuousInternalAssessment			:	30	SemesterEndExamination(3Hours)			:	70		

Prerequisites:None
CourseObjectives:
CO1:Tointroducetheconceptsofmicroelectromechanicaldevices.
CO2:Toknowthefabricationprocess ofMicrosystems.
CO3:To knowthe designconcepts ofmicro sensors.
CO4:Toknowthedesign conceptsofmicro actuators.
CourseOutcomes:
CLO1; Interpret the basics of micro electromechanical systems including their applications.**CLO2:** Recognize the materials in micro fabrication and describe the fabrication processesIncludingsurfacemicromachining, bulkmicromachiningandLIGA.
CLO3: Analyzekeyperformance aspectsof electromechanicalsensorsandactuators.
CLO4: Analyzekeyperformance aspectsofelectromechanicalactuators.

SYLLABUS

UNITI

INTRODUCTION: IntroductiontoDesignofMEMSandNEMS,OverviewofNanoandMicroelectromechanical Systems, Applications of Micro and Nanoelectromechanical systems,MaterialsforMEMS andNEMS: Silicon,silicon compounds, polymers,metals.

UNITII

FABRICATIONTECHNOLOGIES: Photolithography,IonImplantation,Diffusion,Oxidation,CVD,SputteringEtchingtechniques,Micromachining:BulkMicromachining,SurfaceMicromachining,and LIGA.

UNITIII

MICRO SENSORS: MEMS Sensors: Design of Acoustic wave sensors, Vibratory gyroscope,CapacitivePressuresensors, Casestudy: Piezoelectricenergyharvester.

UNITIV

MICRO ACTUATORS: Design of Actuators: Actuation using thermal forces, Actuation usingshapememoryAlloys,Actuationusingpiezoelectriccrystals,ActuationusingElectrostaticforces,CaseStudy: RFSwitch.

TEXTBOOKS:

1. Nadim,MalufandKirtWilliams,"An IntroductiontoMicroElectroMechanicalSystemengineering,Artech house,IncBoston 2003.
2. StephenBeeby,GrahamEnsell,MichaelKraft,NeilWhite"MEMSMechanicalSensors", Artechhouse,IncBoston2003.

REFERENCEBOOKS:

1. TaiRanHsu,MEMS andMicrosystemsDesignandManufacture,Tata McrawHill,2002.

BAPATLAENGINEERINGCOLLEGE::BAPATLA
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SatelliteCommunication-ProfessionalElective-IV
IVB. Tech– I Semester20ECD41)

Lectures	3	Tutorial	0	Practical	0	Credits	3
ContinuousInternalAssessment	:	30	SemesterEndExamination(3Hours)			:	70

Prerequisites: None

CourseObjectives:

CO1: To get knowledge of every aspects of satellite communication like orbital mechanics,launching techniques, satellite link design, earth station technology and different accesssystemtowards asatellite.

CO2: Toexplainthetoolsnecessaryforthecalculationofbasicparametersinasatellite Communicationsystem.

CO3: Toproducegraduateswhounderstandhowtoanalyzeandmanipulatedigitalsignalsandtodetermine theorbitalissuestohavethefundamentalknowledgetodoso,fornavigationandGPS.

CO5: ToUnderstand the principles of GlobalPositioningSystem (GPS) andworking.

CourseOutcomes: Studentswill beable to

CLO1:UnderstandstheFundamentalConceptsofSatelliteCommunication,Orbitalmechanismand Computes look angles.

CLO2: StudiestheSatellitesubsystemsandtheireffectiveworkingandsatelliteLinkdesign models.

CLO3: Understandsandexaminethemultipleaccesstechniques(FDMA,TDMA,CDMA)usedforSatellite Communication.

CLO4: DescribestheVSATsystemsused anditsapplications

SYLLABUS

UNIT I

Introduction: A brief history of Satellite communications, Orbital Mechanics and Launchers: Orbital mechanics, Look angle determination, Orbital perturbations, Orbit determination, Launch and Launch vehicles, Orbital effects in Communication System performance.

UNIT II

Satellites: Satellite sub systems, Attitude and Orbit Control system (AOCS), Telemetry, Tracking, Monitoring, Power Systems, Communication subsystems, satellite antennas.

Satellite Link Design: Introduction, Basic transmission theory, System noise temperature and G/T ratio. Satellite Downlink and Uplink Design.

UNIT III

Multiple Access: Introduction, FDMA, TDMA, CDMA.

VSAT systems: Introduction, Overview of VSAT systems, Network Architectures, Access control Protocols, Basic techniques, VSAT Earth Station Engineering.

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UNIT IV

Satellite Navigation and Global positioning System: Introduction, Radio and satellite Navigation, GPS position location Principles, GPS Navigation Message, GPS Signal Levels, Timing Accuracy, GPS Receiver Operation, and Differential GPS.

TEXTBOOKS:

1. “Satellite Communications”, Timothy Pratt, Charles Bostian, Jeremy Allnutt, 2nd Edition JohnWileyIndia, 2006.
2. “SatelliteCommunications”,byDennisRoddy,McGraw-HillInternationalEdition.

REFERENCEBOOKS:

1. “AdvancedElectronicCommunicationSystems”,byWTomasi,PearsonEducation.

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BAPATLAENGINEERINGCOLLEGE::BAPATLA
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WirelessNetworks-ProfessionalElective-IV
IVB. Tech–I Semester(20ECD42)

Lectures	3	Tutorial	0	Practical	0	Credits	3
ContinuousInternalAssessment	:	30	SemesterEndExamination(3Hours)			:	70

Prerequisites: Mobile&CellularCommunications(20ECDC22)
CourseObjectives:
CO1: Thestudentsshouldgetfamiliarwiththewireless/mobilemarketand thefutureneeds.
CO2: Togetfamiliarwithkeyconceptsofwirelessnetworks,standards,technologies.
CO3: Tolearnhowtodesignandanalyzevariousmediumaccess.
CO4: To learnhow to evaluateMAC andnetworkprotocols usingnetworksimulationsoftware.
CourseOutcomes: At theendofthe course, studentwillbe ableto
CLO1: Understandthearchitectureofdifferentwirelessnetworkslikespreadspectrum,HiperLA NandBluetooth.
CLO2:UnderstandthenetworkarchitectureofWiMAXnetworks.
CLO3: Understandthe wirelesscellularnetworksfrom1Gto4G.
CLO4:Understandthe networkarchitectureofwireless wideareanetworks.

SYLLABUS

UNIT - I

Introduction to Ad Hoc Networks - Characteristics of MANETs, Applications of MANETs and Challenges of MANETs. Routing in MANETs - Criteria for classification, Taxonomy of MANET routing algorithms, Topology based routing algorithms-Proactive: DSDV; Reactive: DSR, AODV; Hybrid: ZRP; Position-based routing algorithms-Location Services-DREAM,

UNIT - II

Broadcasting, Multicasting and Geocasting: Introduction, Broadcast Storm- Broadcasting in a MANET, Flooding-Generated Broadcast Storm, Rebroadcasting Schemes-Simple-flooding, Probability-based Methods, Area-based Methods, Neighbor Knowledge based methods, Multicasting-Issues in Providing Multicast in a MANET, Introduction to Geocasting.

UNIT - III

Wireless Sensor Networks: Introduction, The Mica Mote, Sensing and Communication Range, Design Issues - Challenges, Energy Consumption, Clustering of Sensors - Regularly placed sensors, Heterogeneous WSNs, Mobile Sensors, and WSN Applications.

UNIT - IV

Attacks in Ad hoc and Sensor Networks: Active and passive attacks- Black hole, Gray hole, Wormhole, Rushing attacks, Sybil attack. DDoS attack.
Security: Introduction, Distributed Systems Security, Security in Ad Hoc Networks-Requirements, Security Solutions Constraints, Challenges, Secure Routing- Problems Affecting Secure Ad Hoc Routing, WSNSecurity.

TEXTBOOKS:

1. SchillerJ.,MobileCommunications,AddisonWesley,2000.
2. VijayGarg,"WirelessCommunicationsandnetworking",1st Edition,Elsevier2007.

REFERENCEBOOKS:

1. Stojmenic Ivan, Handbook of Wireless Networks and Mobile Computing, John WileyandSonsInc, 2002.
2. YiBingLinand ImrichChlamtac,WirelessandMobileNetworkArchitectures,JohnWileyand SonsInc, 2000.
3. PandyaRaj,MobileandPersonalCommunicationsSystemsandServices,PHI,2000.

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AdvancedDSP-ProfessionalElective-IV
IVB. Tech – ISemester(20ECD43)

Lectures	3	Tutorial	0	Practical	0	Credits	3		
ContinuousInternalAssessment	:	30	SemesterEndExamination(3Hours)				:	70	

Prerequisites: CoursesonSignalsandSystems,DigitalSignalProcessing

CourseObjectives: To learn
CO1:BasicsofMultirate systemcomponents,Polyphasedecompositionof Digitalfilterbanks.
CO2: Various types of Multirate Filter banks, Perfect Reconstruction of the filter banks.**CO3:**FundamentalofContinuousWavelets, STFTandtheproperties of Wavelets.
CO4: Theconceptof DigitalWaveletTransformandsignalspacesandpropertiesofit.

CourseOutcomes: Studentswill beable to
CLO1: AnalyzevarioustypesofMultiratecomponentsandsamplingrateconversionsin DSP.
CLO2: ConstructionofTwo-Channel,L-ChannelQMF.
CLO3: UnderstandtheimportanceandpropertiesoftheContinuousWaveletTransformsandknowthedifferencebetween continuousanddiscretewavelettransform.
CLO4: Knowaboutthediscretewavelettransforms,scalingfunctions,functionspaces,nestedspacesand standard notations used in it.

SYLLABUS

UNIT-I

Basicsampleratealterationdevices,Filtersinsamplingratealterationsystems,Multistagedesignofdecimatorandinterpolator,Polyphasedecomposition,Arbitrary-Ratesamplingrateconverters,Digitalfilterbanks, Nyquist filters.

UNIT-II

Two-Channel Quadrature –Mirror Filter banks, Perfect reconstruction Two-Channel FIR Filterbanks,L-ChannelQMFbanks,MultilevelFilterbanks.

UNIT– III

ContinuouswaveletandShortTimeFourierTransform:Introduction,WaveletTransform,Mathematical Preliminaries, Continuous Time-frequency representation of signals, WindowedFourierTransform(STFT),UncertaintyprincipleandTime-Frequencytiling,PropertiesofWaveletsusedinContinuousWaveletsTransforms,ContinuousversusDiscreteWaveletTransform.

UNIT– IV

DiscreteWaveletTransform:Introduction,HAARScalingfunctionsandFunctionspaces,Nested Spaces, HAAR Wavelet Function, Orthogonality, Normalization of HAAR bases at differentscales,standardizingtheNotations,RefinementrelationwithrespecttoNormalizedbases,Daubechies Wavelets.

TEXTBOOKS:

1. DigitalSignalProcessing,AcomputerBasedApproachbySanjitKMitra,TataMcGrawHillPublishing.
2. InsightintoWaveletsfrom TheorytoPracticebyK.P.Soman, K.I.Ramachandran,N.G.Reshmi,PHIPublications, Third Edition, 2010.

REFERENCEBOOKS:

1. MultirateSystemsandFilterBanks,P.P.Vaidyanathan,PearsonEducation,LowPricedEdition, 2006.
2. WaveletTransforms-IntroductiontoTheoryandApplications,RaghuveerM.Rao,Ajitopardikar,Pearson Education, Asia.

BAPATLAENGINEERINGCOLLEGE::BAPATLA
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CloudComputing-ProfessionalElective-IV
IVB. Tech – I Semester(20ECD44)

Lectures	3	Tutorial	0	Practical	0	Credits	3
ContinuousInternalAssessment	:	30	SemesterEndExamination(3Hours)			:	70

Prerequisites: None

CourseObjectives: Theobjectiveofthiscourseisto
CO1: Understandtheimportanceofcloud,migrationtocloud andintegrationasaservice.**CO 2:** Different Cloud Deploy Models & Service Models in enterprise cloud environment.**CO3:**Cloud Virtual Machines Migrationandcloud enhancingservice.
CO4: CloudData securityissues,workflowenginesand SLAmanagement forclouds.

CourseOutcomes: Aftersuccessfulcompletionofthecourse,thestudentscanbe ableto:
CLO1: Analyze the Integrate Enterprise cloud Environments, Cloud Deployment.
CLO2: Determine the use of Cloud Virtual Machines and cloud enhancing service.
CLO3: Evaluatethe SecureDistributedData Storageandworkflow enginesforclouds.
CLO4: Describethe datasecurityand SLA Management.

SYLLABUS

UNIT– I

Introduction to cloud computing: Cloud Computing in a Nutshell, roots of Cloud Computing,Layers and Types of Clouds, Desired Features of Cloud, Cloud Infrastructure Management,Infrastructureas aServiceProviders,Platform asaServiceProviders.
MigrationintoaCloud: Introduction,BroadApproachestoMigratingintotheCloud
Enriching the 'Integration as a Service' Paradigm for the Cloud Era: An Introduction, TheOnsetofKnowledgeEra,TheEvolutionofSaaS,ThechallengesofSaaSparadigm,Newintegration scenarios, The integration methodologies, Saas integration products and platforms,SaaS Integration Services, Business to Business Integration(B2Bi) Services, A Framework ofSensorCloudIntegration.

UNIT-II

TheEnterpriseCloudComputingParadigm: Relevantdeploymentmodelsforenterprisecloud computing, Issues for Enterprise Applications on the Cloud, Transition Challenges, BusinessDriverstoward aMarketplacefor EnterpriseCloud Computing, TheCloud SupplyChain.
Virtual Machines Provisioning and Migration Services: Virtualization Technology overview,Virtual Machines Provisioning and Manageability, Virtual Machine Migration Services, VMProvisioningand Migration in Action, Provisioningin theCloud Context.

UNIT– III

Secure Distributed Data Storage in Cloud Computing: Introduction, Cloud Storage: fromLANsTOWANs, Technologies for Data SecurityinCloud Computing.
WorkflowEngineforClouds: Introduction,WorkflowManagementSystemsandClouds,Architectureof WorkflowManagement Systems,UtilizingClouds forWorkflowExecution.

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UNIT– IV

SLA Management in Cloud Computing: Traditional Approaches to SLO Management, TypesofSLA, LifeCycleofSLA,SLAManagementin Cloud,AutomatedPolicy-basedManagement.

Data Security in the Cloud: An Introduction to the Idea of Data Security, The Current State ofData Security in the Cloud, Homo Sapiens and Digital Information, Cloud Computing and DataSecurity Risk, Cloud Computing and Identity, The Cloud, Digital Identity, and Data Security,ContentLevel Security—Pros and Cons.

TEXTBOOKS:

1. RajkumarBuyya,JamesBroberg,AndrZejGoscinski,CloudComputingPrinciplesandParadigms,WileyPublications.
2. CloudComputingBible,BarrieSosinsky,Wiley-India, 2010.

REFERENCEBOOKS:

1. MichaelMiller,CloudComputing–Web-BasedApplicationThatChangetheWayYouWorkandCollaborate Online,Pearson Publications.
2. ThomasErl,ZaighamMahmood,&RicardoPuttini,CloudComputing-Concepts,Technology&ArchitecturePearson Publications.

WEBRESOURCES:

1. Cloud computing course by Prof. Soumya K. Ghoshisavailable@https://nptel.ac.in/courses/106105167/
2. CloudcomputingandDistributedSystemscoursebyDr.RajivMisraisavailable@https://nptel.ac.in/courses/106104182/

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LowPowerVLSI-ProfessionalElective-V
IVB. Tech – ISemester(20ECD51)

Lectures	3	Tutorial		0	Practical	0	Credits		3		
ContinuousInternalAssessment			:	30	SemesterEndExamination(3Hours)			:	70		

Prerequisites: None

CourseObjectives: Tolearn
CO1: TheintroductionandthebackgroundofLOWpowerdissipationandunderstandtheMOStransistoroperations.
CO2: ToobtainknowledgeabouttheoperationofdifferentMOSInvertersandMOSCombinationalCircuits.
CO3: To understand how the different Source of Power Dissipation occurred in the circuits.**CO4:**ToUnderstandtheoperationhowtoMinimizingLeakagePowerindifferentwaysandunderstandthe differentCADTools forLowPower VLSICircuits.
CourseOutcomes: Students willbe ableto
CLO-1: Understandtheconceptsofthevelocitysaturation;impactIonizationandhotElectronEffect.
CLO-2: Implement Lowpowerdesignapproachesforsystemlevelandcircuitlevelmeasures.
CLO-3: Analyzethe conceptsdifferent typesof SourcesofPower Dissipation.
CLO-4: Understand the concepts of different fabrication of multiple threshold voltages, differentapproachesforminimizingleakagepower.

SYLLABUS

UNITI

Introduction: Historical background, why low power, sources of power dissipations, low powerdesignmethodologies.
MOS Transistors: Introduction, the structure of MOS Transistor, the fluid model, modes ofoperation of MOS transistor, Electrical Characteristics of MOS Transistors, MOS Transistors asSwitch.

UNITII

MOS Inverters: Introduction, inverters and its characteristics, configurations, inverter ratio indifferent situations, switching characteristics, delay parameters, driving parameters, driving largecapacitiveloads.
MOS Combinational Circuits: Introductions, Pass-transistor logic, Gate logics, MOS DynamicCircuits.

UNITIII

Source of Power Dissipation: Introduction, short-circuit power dissipation, Switching powerdissipation,glitchingpower dissipation, leakagepower dissipation.

UNITIV

MinimizingLeakagePower:introduction,fabricationofmultiplethresholdvoltages,approaches for minimizing leakage power, adiabatic logic Circuits, Battery-Driven System, CAD Tools forLowPower VLSICircuits.

TEXTBOOKS:

1. Ajit.Pal,LowpowerVSLICircuitsandsystems, springer.
2. SungMoKang,Yusuf Leblebici,CMOSDigital IntegratedCircuits,TataMcgragHill.

REFERENCEBOOKS:

1. NeilH.EWesteandK.Eshraghain,PrinciplesofCOMSVLSIDesign,2ndEdition,AddisonWesley(Indianreprint).
2. Bellamour,andM.I.Elmasri,LowpowerVLSI CMOSCircuitDesign,KluwerAcademicPress,1995.
3. AnanthaP.ChandrakasanandRobertW.Brodersen,LowPowerDigitalCMOSDesign,KluwerAcademicPublishers, 1995.

BAPATLAENGINEERINGCOLLEGE::BAPATLA
(Autonomous)

AdvancedWirelessCommunication-ProfessionalElective-V
IVB. Tech– I Semester(20ECD52)

Lectures	3	Tutorial	0		Practical	0	Credits	3			
ContinuousInternalAssessment			:	30	SemesterEndExamination(3Hours)			:	70		

Prerequisites: None

CourseObjectives (COs): Themain objectivesof thiscourseare:
CO1: Tounderstandthefundamentalconceptsandphysicalmodelingofwirelesscommunications ystems.
CO2: To impart thecapacityof Multi-AntennaSystems
CO3:Toprovidefundamentalsconceptsof MassiveMIMO and Milli-MeterWaveSystems
CO4:Tounderstandthe conceptsof MIMOBeam formingandNOMA.

Course Outcomes (CLOs): On successful completion of this course students will be able to:
CLO1:Understandthefundamentalconcepts,PhysicalModelling,and,Multi-antennasystemofwirelesscommunicationsystems.
CLO2:DesignthecapacitymodelsofMulti-AntennaSystems,optimalandsub-optimalMIMOreceivers.
CLO3:Understandtheneed forMassiveMIMO andMilli-MeterWaveTechnology.
CLO4: Understandthe fundamentalconceptsofMIMOBeam formingandNOMATechnology.

SYLLABUS

UNIT-I

AdvancedWirelessCommunication: IntroductiontoWirelessCommunication,PhysicalModelingforWirelessChannels,BasebandandPassbandRepresentation,RayleighFadingChannels, Bit Error Rate of Wired / Wireless Channel, Deep Fade, and Probability of ErrorAnalysis.
Multi-Antenna System: Introduction to Multi-Antenna Diversity, Receive Diversity: Single-InputMultiple-Output(SIMO),BERofSIMOwithMaximal-Ratio-Combining,ReceiveCombiningTechniques,MISO and MIMOWireless System.

UNIT-II

CapacityofMulti-AntennaSystems: CapacityofSISOAdditiveWhiteGaussianNoise(AWGN)Channel,CapacityofMulti-AntennaAWGNandWirelessChannels,CapacityofSlow-FadingChannels,Fast-FadingChannels,CapacityofFixedMIMOChannelwithTransmitChannel State Information (CSI), Capacity of Fixed MIMO Channel Without Transmit CSI,Optimaland SuboptimalMIMO Receivers.

UNIT-III

Massive Multiple-Input Multiple-Output (MIMO): Massive MIMO Fundamentals, Basics ofChannel Estimation, Channel Estimation of Multi-cell Multiuser System, Element Wise-MMSE,LS,and Other Channel Estimation Techniques,Spectral EfficiencyAnalysis.
Millimeter-Wave (mm-Wave) Systems: mm-Wave System and Challenges, mm-Wave Channels,mmWaveDesign Considerations.

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UNIT– IV

MIMOBeamforming: Architecture,SystemModel,ObjectivesandAlgorithms. Non-OrthogonalMultipleAccess(NOMA):MotivationofNOMA,Two-UserNOMA,AchievableThroughput,Multi-User NOMA, MIMONOMA.

TEXTBOOKS:

1. EzioBiglieri,"MIMOWirelessCommunications"CambridgeUniversityPress.
2. AdityaK.Jagannatham,"PrinciplesofModernWirelessCommunicationSystems"

REFERENCEBOOKS:

1. TheodoreS.Rappaport,WirelessCommunicationsPrinciplesandPractice,2ndEdition, PearsonEducation, 2003.
2. WirelessCommunications"1stEdition,KindleEdition,Goldsmith.

ONLINESOURCES:

1. https://archive.nptel.ac.in/courses/117/104/117104099/.
2. https://developer.arm.com/ip-products/processors/cortex-m/cortex-m3.

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SemiconductorDeviceModelling-ProfessionalElective-V
IVB. Tech– I Semester(20ECD53)

Lectures	3	Tutorial	0		Practical	0	Credits	3	
ContinuousInternalAssessment			:	30	SemesterEndExamination(3Hours)			:	70

Prerequisites: AnalogElectronics,Analog IntegratedCircuitsandApplications.
CourseObjectives: Inthiscourse,studentswilllearnthefollowingtopics
CO1: Tounderstandthe physicsofMOSFEToperationanditscharacteristics.
CO2: Analysis ofSOIMOSFET electrical characteristics.
CO3: To standard the advanced Nanoscaletransistors.
CO4: Todevelopastandardequationforthetransistorfabricationtoverification.

CourseOutcomes: Students willbe ableto
CLO1: Explaintheequations,approximationsandtechniquesavailableforderivingamodelwith specified properties, for a general device characteristic with known qualitative theory.
CLO2: Apply suitable approximations and techniques to derive the model referred to abovestartingfrom drift-diffusion transport equations (assumingtheseequations hold).
CLO3: Offer cluesto qualitativeunderstandingof the physics ofanewdeviceandconversion ofthisunderstandinginto equations.
CLO4: Explainhow theequationsget lengthyand parametersincreaseinnumberwhiledevelopingacompact model.

SYLLABUS

UNIT– I

MOSCapacitor: EnergybanddiagramofMetal-Oxide-Semiconductorcontacts,ModeofOperations:Accumulation,Depletion,Midgap,andInversion,1 DElectrostaticsofMOS,Depletion Approximation, Accurate Solution of Poisson's Equation, CV characteristics of MOS,LFCV and HFCV, Non-idealities in MOS, oxide fixed charges, interfacial charges, Midgap gateElectrode, Poly-Silicon contact, Electrostatics of non-uniform substrate doping, ultrathin gate-oxideand inversionlayerquantization, quantumcapacitance, MOS parameterextraction.

UNIT-II

Physics of MOSFET: Drift-Diffusion Approach for IV, Gradual Channel Approximation, Sub-threshold current and slope, Body effect, Pao&Sah Model, Detail 2D effects in MOSFET, Highfield and doping dependent mobility models, High field effects and MOSFET reliability issues(SILC,TDDB, & NBTI), Leakage mechanisms in thin gate oxide, High-KMetal Gate MOSFETdevicesandtechnologyissues,IntrinsicMOSFET capacitancesandresistances,Meyermodel.

UNITIII

SOIMOSFET:FDSOIandPDSOI,1D ElectrostaticsofFDSOIMOS,VTdefinitions,Backgatecoupling and body effect parameter, IV characteristics of FDSOI-FET, FDSOI-sub-thresholdslope,Floatingbodyeffect,singletransistorlatch,ZRAMdevice,BulkandSOIFET:discussionsreferringto theITRS.

UNITIV

Nanoscale Transistors: Diffusive, Quasi Ballistic & Ballistic Transports, Ballistic planer andnano wire -FET modeling: semi-classical and quantum treatments. Advanced MOSFETs: StrainEngineered Channel materials, Mobility in strained materials, Electrostatics of double gate, andFin-FETdevices.

TEXTBOOKS:

1. S.M.Sze&KwokK.Ng,PhysicsofSemiconductorDevices,Wiley.
2. B.G.Streetman,S.K.Banerjee,SolidStateElectronicDevices,Pearson,(2016).

REFERENCEBOOKS:

1. N.Arora,MOSFET modelingfor VLSISimulation:Theoryand Practice, World.
2. YannisT sividis, Operation and Modelingof theMOS Transistor, Oxford UniversityPress.

BAPATLAENGINEERINGCOLLEGE::BAPATLA
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AdvancedSensors-ProfessionalElective-V
IVB. Tech – I Semester(20ECD54)

Lectures	3	Tutorial	0	Practical	0	Credits	3
ContinuousInternalAssessment	:	30	SemesterEndExamination(3Hours)			:	70

Prerequisites: None
CourseObjectives: Theobjectiveofthiscourseisto
CO 1: Understand the working principles of various semiconductor sensors and their application.
CO2: Understandtheworkingprinciplesofchemicalandbiomedicalsensorsandtheirapplication.
CO3: Knowvarious micro sensors for measuringvarious physical quantities.
CO4: Knowvarious smart sensorsandtheir application.
CourseOutcomes: Aftersuccessfulcompletionofthecourse,thestudentscanbe ableto:
CLO1: Statethe workingprincipleof anysemiconductor sensor and its application.
CLO2: Statetheworkingprincipleofanychemical orbiomedicalsensor and its application.
CLO3: Listapplications ofmicrosensors.
CLO4: Design signal processingforanymeasurement application.

SYLLABUS

UNIT – I

SEMICONDUCTOR SENSORS: Metal Oxide Semiconductors, Hall Elements, Silicon Sensors, Silicon planner technology, Micro machine technology, mechanical, magnetic, chemical and other signals, IC sensors.

UNIT – II

CHEMICAL AND BIOMEDICAL SENSORS: Polymers, chemically modified electrodes, Membrane electrodes, Thick Film Devices, catalytic devices, Gas sensors. OPTICAL SENSORS: Lasers, photo-detectors and optical fiber as sensors, integrated optics.

UNIT – III

MICRO SENSORS: Thin film sensors, Applications of Micro sensors, Mechanical, Magnetic and Chemical signals, Acoustic steam leak detector.

UNIT – IV

INTERFACING AND SIGNAL PROCESSING: Intelligent and smart sensors, concepts of redundant and multi – sensory systems, operation in coded mode and mapping mode.

TEXTBOOKS:

1. MiddleHockSandAndel SA–SiliconSensors,AcademicPress,London,1989
2. EdmondsTE-ChemicalSensors-,BlackieLondon1988.

REFERENCEBOOKS:

1. PatranabisD– SensorsandTransducers, WheelerPublishing.

BAPATLAENGINEERINGCOLLEGE::BAPATLA
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System On Chip Architecture -ProfessionalElective-V
IVB. Tech – I Semester(20ECD55)

Lectures	3	Tutorial	0		Practical	0	Credits	3		
ContinuousInternalAssessment			:	30	SemesterEndExamination(3Hours)			:	70	

Prerequisite: Embedded System Design

Course Objectives:
CO1: To introduce the architectural features of system on chip.
CO2: To imbibe the knowledge of customization using case studies.
CO3: To explore the knowledge in Memory Design for SOC.
CO4: To Know the Interconnect Customization.

Course Outcomes:
CLO1: Expected to understand SOC Architectural features.
CLO2: To acquire the knowledge on processor selection criteria and limitations
CLO3: To acquires the knowledge of memory architectures on SOC.
CLO4: To understands the interconnection strategies and their customization on SOC.

Syllabus

UNIT – I

Introduction to the System Approach: System Architecture, Components of the system, Hardware & Software, Processor Architectures, Memory and Addressing. System level interconnection, An approach for SOC Design, System Architecture and Complexity.

UNIT – II

Processors: Introduction, Processor Selection for SOC, Basic concepts in Processor Architecture, Basic concepts in Processor Micro Architecture, Basic elements in Instruction handling. Buffers: minimizing Pipeline Delays, Branches, More Robust Processors, Vector Processors and Vector Instructions extensions, VLIW Processors, Superscalar Processors.

UNIT – III

Memory Design for SOC: Overview of SOC external memory, Internal Memory, Size, Scratchpads and Cache memory, Cache Organization, Cache data, Write Policies, Strategies for line replacement at miss time, Types of Cache, Split – I , and D – Caches , Multilevel Caches, Virtual to real translation, SOC Memory System , Models of Simple Processor – memory interaction.

UNIT - IV

Interconnect Customization: Inter Connect Architectures, Bus: Basic Architectures, SOC Standard Buses, Analytic Bus Models, Using the Bus model, Effects of Bus transactions and contention time. SOC Customization.

TEXT BOOKS:

1. Computer System Design System-on-Chip by Michael J. Flynn and Wayne Luk, Wiely India Pvt. Ltd.
2. ARM System on Chip Architecture – Steve Furber –2 ndEed., 2000, Addison Wesley Professional.

REFERENCE BOOKS:

1. Design of System on a Chip: Devices and Components – Ricardo Reis, 1st Ed., 2004, Springer
2. Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology) – Jason Andrews – Newnes, BK and CDROM
3. System on Chip Verification – Methodologies and Techniques –PrakashRashinkar, Peter Paterson and Leena Singh L, 2001, Kluwer Academic Publishers

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DigitalImageProcessing-Open/JOC-ElectiveIII
IVB. Tech– ISemester(20ECI01)

Lectures	3	Tutorial	0	Practical	0	Credits	3
ContinuousInternalAssessment	:	30	SemesterEndExamination(3Hours)			:	70

Prerequisites: None

CourseObjectives: Inthiscourse,students willlearnthefollowingtopics
CO1: Recallandsummarizethedigitalimagefundamentalsandtobeexposedtobasicimageprocessingtechniques.
CO2:Illustratevarious filteringtechniques forimagesin termsofspatial andfrequencydomain.
CO3: Befamiliarwithimagerestorationenhancement.
CO4: Tounderstand the importanceofColour imageprocessingtechniques.

CourseOutcomes: Studentswill beable to
CLO1:Understandthedigitalimagefundamentalsandbasic imageprocessingtechniques.
CLO2: Makeuseofspatial andfrequencydomainfilteringfor Imageenhancement.
CLO3: ComparevariousImageRestorationtechniques.
CLO4:ExplainvariousColorimageprocessingoperationsandEvaluateImagecompressionusing varioustechniques.
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SYLLABUS

UNIT– I

INTRODUCTION: WhatIsDigitalImageProcessing?TheOriginsofDigitalImageProcessing, Examples of Fields that Use Digital Image Processing, Fundamental Steps in Digital ImageProcessing,Componentsof anImageProcessingSystem.
DIGITALIMAGEFUNDAMENTALS: ElementsofVisualPerception,LightandtheElectromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization,SomeBasic Relationships between Pixels.

UNIT– II

SPATIAL AND FREQUENCY DOMAIN FILTERING: Background. Some Basic IntensityTransformation functions, Histogram Processing, Fundamentals of Spatial Filters, SmoothingSpatial Filters, and Sharpening Spatial Filter. The basics of filtering in the Frequency Domain, Imagesmoothingusingfrequencydomainfilters,Imagesharpeningusingfrequencydomain filters.

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UNIT– III

IMAGE RESTORATION:A Model of theImage Degradation/Restoration Process, NoiseModels,RestorationinthePresenceofNoiseOnly-SpatialFiltering,PeriodicNoiseReductionbyFrequencyDomainFiltering,InverseFiltering,MinimumMeanSquareError(Wiener)Filtering.

UNIT– IV

COLORIMAGEPROCESSING: ColorFundamentals,ColorModels,Pseudo colorImageProcessing,Basicsof Full-ColorImageProcessing.
IMAGECOMPRESSION: Fundamentals,CompressionModel,Huffmancoding,Arithmeticcoding,LZW coding, Run length coding.

TEXTBOOKS:

1. R.C.Gonzalez,R.E.Woods,DigitalImageProcessing4th Edition,PearsonEducation Publishers, 2019.
2. MilanSonka,VaclavHlavacandRogerBoyle,ImageProcessingAnalysisandMachineVision,Thomsonlearning, Second Edition, 2001.

REFERENCEBOOKS:

1. SJayaraman,SEsakkirajan,TVeerakumar,DigitalImageProcessing,Mc-GrahHillPublications,2010.
2. S.Sridhar,Digital ImageProcessing,OxfordUniversityPress,2016.

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EmbeddedSystem&Design-Open/JOC-ElectiveIII
IVB. Tech– I Semester(20ECI02)

Lectures	3	Tutorial	0		Practical	0	Credits	3			
ContinuousInternalAssessment			:	30	SemesterEndExamination(3Hours)			:	70		

Prerequisites: None.

CourseObjectives (COs): Themain objectivesof thiscourseare:
CO1: Toimpartbasicdesignandarchitecturalconceptsofembeddedsystems.
CO2: ToimparttheconceptsofReal-TimeOperatingSystemsandprovidetheschedulingAlgorithms.
CO3: ToprovidefundamentalsofprevalentIP-Core:ARMCortexM3/M4&Designofanembeddedsystem usingARM CortexProcessor.
CO4:ToexplaininstructionsetofARMCortexM3/M4processorand explaintheALP's.

Course Outcomes (CLOs): On successful completion of this course students will be able to:**CLO1:**Haveabasicunderstandingofdifferentmethodologiesandapproachesinthedesignofembeddedsystems.
CLO2: Understandtherequirements,andconceptsofReal-TimeOperatingsystemsforreal-timetaskprocessing.
CLO3: Analyzethebasicconcepts,architecture,memorymanagementunit,andfeaturesofEmbedded Processors.
CLO4: UnderstandthebasicconceptsofARMinstructionsetanddesigntheembeddedapplications.

SYLLABUS

UNIT -I

Embedded Systems Design: Introduction to Embedded System, categories of embedded system,specialties,andrecenttrendsinEmbeddedSystem.ArchitectureofanEmbeddedSystem: Hardware Architecture, Software Architecture, Application Software, Communication Software,Development/TestingTools.

UNIT-II

Overview of RTOS: Architecture of the Kernel, Tasks, Task scheduler, real-time tasks, Taskscheduling, Interrupt Service Routine, Memory Management, Semaphores, Mutex, Mailboxes,MessageQueues, EventRegisters,Pipes.
Classificationofschedulingalgorithms:ClockdrivenScheduling,Event-drivenScheduling,Resourcesharing, Priorityinversion problem, Deadlock.

UNIT-III

EmbeddedProcessors: Introduction to ARM family,ARM Architecture- Pipeline, Registers,Operationmodes,
BigEndianandLittleEndian.CacheMechanism,MemoryManagementUnit.

UNIT– IV

ARMInstructions:ARMandThumbInstructionSets,DataProcessingInstructions,DataTransfer Instructions,ControlFlowInstructions,BasicAssemblyLanguagePrograms.
CaseStudy:SmartPhone,DigitalCamera,andAutomaticWashingMachine.

TEXTBOOKS:

1. KVKKPrasad,"Embedded/RealTimeSystems"Dream techPress,2005.
2. AndrewN.Sloss/DominicSymes/ChrisWright,"ARMSystemDeveloper'sGuideDesigningandOptimizing"Elsevier, 2004.

REFERENCEBOOKS:

1. FrankVahid/TonyGivargis,"EmbeddedSystemDesignAunifiedHardware/SoftwareIntroduction"John Wiley&Sons,Inc.
2. JonathanWValvano,"EmbeddedSystems:Real-TimeOperatingSystemsforARMCorte-MMicrocontrollers"CreateSpace, Volume3, 5th Edition, 2019.

ONLINESOURCES:

1. http://users.ece.utexas.edu/~valvano/
2. http://www.nptelvideos.in/2012/11/embedded-systems.html
3. https://developer.arm.com/ip-products/processors/cortex-m/cortex-m3

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DigitalImageProcessing-Open/JobOrientedElective-IV
IVB. Tech– I Semester(20ECJ41)

Lectures	3	Tutorial		0	Practical	0	Credits		3		
ContinuousInternalAssessment			:	30	SemesterEndExamination(3Hours)			:	70		

Prerequisites:NONE

Course Objectives: In this course, students will learn the following topics
CO1: Recall and summarize the digital image fundamentals and to be exposed to basic image processing techniques.
CO2: Illustrate various filtering techniques for images in terms of spatial and frequency domain.
CO3: Be familiar with image restoration enhancement.
CO4: To understand the importance of Colour image processing techniques.

CourseOutcomes: Studentswill beable to
CLO1: Understandthedigitalimagefundamentalsandbasicimageprocessingtechniques
CLO2: Makeuseofspatial andfrequencydomainfilteringfor Imageenhancement.
CLO3: ComparevariousImageRestorationtechniques.
CLO4: ExplainvariousColorimageprocessingoperationsandalsoEvaluateImagecompressionusingvarioustechniques.

SYLLABUS

UNIT – I

INTRODUCTION: WhatIsDigitalImageProcessing?TheOriginsofDigitalImageProcessing, ExamplesofFieldsthatUseDigitalImageProcessing,FundamentalStepsinDigitalImageProcessing, Components of anImageProcessingSystem.

DIGITALIMAGEFUNDAMENTALS: ElementsofVisualPerception,LightandtheElectromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization,Some Basic Relationships between Pixels.

UNIT – II

INTENSITYTRANSFORMATIONSANDSPATIALFILTERING: Background.SomeBasicIntensityTransformationfunctions,HistogramProcessing,FundamentalsofSpatialFilters,SmoothingSpatialFilters,SharpeningSpatialFilters.
FILTERING IN THE FREQUENCY DOMAIN: Background, Extension to Functions of twovariables, Some properties of 2D Discrete Fourier Transform, The basics of filtering in theFrequency Domain, Image smoothing using frequency domain filters, Image sharpening usingfrequencydomain filters.

UNIT – III

IMAGE RESTORATION: A Model of the Image Degradation/Restoration Process, NoiseModels, Restoration in the Presence of Noise Only-Spatial Filtering, Periodic Noise ReductionbyFrequencyDomainFiltering,Linear,Position-InvariantDegradations,EstimatingtheDegradationFunction,InverseFiltering,MinimumMeanSquareError(Wiener)Filtering.
COLOR IMAGE PROCESSING: Color Fundamentals, Color Models, Pseudocolor ImageProcessing, Basics of Full-Color Image Processing, Color Transformations, Smoothing andSharpening.

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UNIT – IV

IMAGECOMPRESSION: Fundamentals,SomebasiccompressionMethods,Huffmancoding, Golomb coding, Arithmetic coding, LZW coding, Run length coding, Symbol based coding, Bitplanecoding, Block transform coding, Predictive coding.

MORPHOLOGICAL IMAGE PROCESSING: Preliminaries, Erosion and Dilation, Opening andClosing, TheHit& Miss Transformation.

TEXTBOOKS:

1. R.C.Gonzalez,R.E.Woods,DigitalImageProcessing4th Edition,PearsonEducation Publishers, 2019.
2. SJayaraman,SEsakkirajan,TVeerakumar,DigitalImageProcessing,Mc-GrahHillPublications,2010.

REFERENCEBOOKS:

1. MilanSonka,VaclavHlavacandRogerBoyle,ImageProcessingAnalysisandMachineVision,Thomsonlearning, Second Edition, 2001.
2. S.Sridhar,Digital ImageProcessing,OxfordUniversityPress,2016.

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BiomedicalSignalProcessing-Open/JobOrientedElective-IV
IVB. Tech– I Semester(20ECJ42)

Lectures	3	Tutorial	0		Practical	0	Credits	3			
ContinuousInternalAssessment			:	30	SemesterEndExamination(3Hours)			:	70		

Prerequisites: BiologyforEngineers,Digital signalprocessing, Bio-MedicalInstrumentation.
CourseObjectives: Inthiscourse,students willlearnthefollowingtopics
CO1: TounderstandSourcesandcharacteristicsofnoiseandartifactsinbiosignals.
CO2: Tounderstand use of biosignals indiagnosis,patient monitoring.
CO3:Toexploreresearchdomaininbiomedicalsignalprocessing.
CO4: Toexploreapplicationofestablished engineeringmethods tocomplexbiomedical signals.
CourseOutcomes: Studentswill beable to
CLO1: Thestudentwill be ableto modelabiomedical system.
CLO2: The student will be able to understand various sources of bio signal distortions.**CLO3:**ThestudentswillbeabletoanalyzeECGsignalwithcharacteristic featurepoints.**CLO4:**Thestudentswillbeableto analyzeEEG signalwithcharacteristic featurepoints.

SYLLABUS

UNIT– I

Mathematics for Bio-Medcial Signal Processing: STFT - Introduction to wavelets – CWT andDWT with Haar wavelet, Random Processes: Stationary random process, Ergodicity,Powerspectral density and autocorrelation function of random processes. Noise power spectral densityanalysis,Noisebandwidth and noise figureof systems.

UNIT– II

DataCompressionTechniques: Lossy andLosslessdatareductionAlgorithms.ECGdatacompressionusingTurning point,AZTEC,CORTES,Huffmancoding,vectorquantization,DICOMStandards.

UNIT-III

Cardiological Signal Processing: Pre-processing, QRS Detection Methods, Rhythm analysis,ArrhythmiaDetectionAlgorithms,AutomatedECGAnalysis,ECGPatternRecognition. AdaptiveNoise Cancelling: Principles of Adaptive Noise Cancelling, Adaptive Noise Cancelling with theLMS Adaptation Algorithm, Noise Cancelling Method to Enhance ECG Monitoring, Fetal ECGMonitoring.

UNIT-IV

Neurological Signal Processing: Modeling of EEG Signals, Detection of spikes and spindlesDetection of Alpha, Beta and Gamma Waves. Auto Regressive (A.R.) modeling of seizureEEG.SleepStageanalysis,InverseFiltering,Leastsquaresandpolynomialmodeling.

TEXT BOOKS:

1. D.CReddy,"BiomedicalSignalProcessing,PrinciplesandTechniques",TataMcGrawHillPublishingCompanyLimited, First Edition, 2005
2. WillisJTompkins,"BiomedicalDigitalSignalProcessing",PrenticeHallIndiaPrivateLimited,First Edition, 2006.

REFERENCEBOOKS:

1. RangarajMRangayyan"BiomedicalSignalAnalysis–Acasestudyapproach"IEEEpressseriesin biomedical engineering,First Edition, 2002.
2. WeitkunatR,"DigitalBioDignalProcessing",1991,Elsevier.
3. AkayM,"BiomedicalSignalProcessing",IEEEPress.
4. Cohen.A,"BiomedicalSignalProcessing-Vol.ITime&FrequencyAnalysis",1986,CRCPress.
5. PeytonZ.Peebles,"Probability,RandomVariables&RandomSignalPrinciples",4th Edition,2009, TMH.

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Robotics-Open/JobOrientedElective-IV
IVB. Tech – ISemester(20ECJ43)

Lectures	3	Tutorial	0		Practical	0	Credits	3			
ContinuousInternalAssessment			:	30	SemesterEndExamination(3Hours)			:	70		

Prerequisites:NONE

COURSEOBJECTIVES:

CO1: Tounderstandthebasicconceptsassociatedwith thedesign&functioningofRobots.
CO2:To studyabout thedrives and effectors usedinRobots.
CO3: To studyabout the sensorsused in Robots.
CO4: Tolearn aboutanalyzingrobotkinematics androbotprogramming.

COURSEOUTCOMES:

CLO1: Understand the concepts of robot and its applications.
CLO2: Design robot with various links, mechanisms and effectors.
CLO3: Studyvarious sensors and its applications.
CLO4: Developstudent skillsinperformkinematicanalysisofrobotsystemandprogramming.

SYLLABUS

UNITI

FUNDAMENTALSOFROBOT

Robot–Definition–RobotAnatomy–Co-ordinateSystems,WorkEnvelope,typesandclassification – Specifications – Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load –RobotParts and Functions– Need forRobots– Different Applications.

UNIT II

ROBOTDRIVESYSTEMSANDENDEFFECTORS

Pneumatic Drives – Hydraulic Drives – Mechanical Drives – Electrical Drives – D.C. ServoMotors, Stepper Motor, A.C. Servo Motors – Salient Features, Applications and Comparison ofDrives End Effectors – Grippers – Mechanical Grippers, Pneumatic and Hydraulic Grippers,MagneticGrippers,VacuumGrippers;TwoFingeredandThreeFingeredGrippers;InternalGrippersand External Grippers; Selectionand Design Considerations.

UNITIII

SENSORSANDMACHINE VISION

Requirementsofasensor,PrinciplesandApplicationsofthefollowingtypesofsensors– Positionofsensors(PiezoElectricSensor,LVDT,Resolvers,OpticalEncoders,PneumaticPositionSensors), Range Sensors (Triangulation Principle, Structured, Lighting Approach, Time of FlightRangeFinders,LaserRangeMeters),ProximitySensors(Inductive,HallEffect,Capacitive, Ultrasonic and Optical Proximity Sensors), Touch Sensors, (Binary Sensors, Analog Sensors),WristSensors,ComplianceSensors,SlipSensors.Camera,FrameGrabber,Sensingand DigitizingImage Data – Signal Conversion, Image Storage, Lighting Techniques. Image Processing andAnalysis– DataReduction:Edgedetection,SegmentationFeatureExtractionandObjectRecognition-Algorithms.Applications–Inspection,Identification,VisualServingandNavigation.

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UNITIV

ROBOTKINEMATICSANDROBOTPROGRAMMING

Forward Kinematics,Inverse Kinematics and Differences; Forward Kinematics and ReverseKinematics of Manipulators with Two, Three Degrees of Freedom (In 2 Dimensional), FourDegreesofFreedom(In3Dimensional)–DeviationsandProblems.TeachPendantProgramming,Lead through programming, Robot programming Languages – VAL Programming – MotionCommands,Sensor Commands, Endeffecter commands, andSimple programs.

TEXTBOOKS:

1. M.P.Groover,"IndustrialRobotics–Technology,ProgrammingandApplications",McGraw-Hill, 2001.
2. Fu.K.S. Gonzalz.R.C., andLeeC.S.G.,"RoboticsControl, Sensing, VisionandIntelligence",McGraw-HillBook Co.,1987.

REFERENCEBOOKS:

1. YoramKoren,"RoboticsforEngineers",McGraw-HillBookCo.,1992.
2. Janakiraman.P.A.,"Roboticsand ImageProcessing",TataMcGraw-Hill,1995.

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DeepLearning-Open/JobOrientedElective-IV
IVB. Tech–I Semester(20ECJ44)

Lectures	3	Tutorial		0	Practical	0	Credits		3		
ContinuousInternalAssessment			:	30	SemesterEndExamination(3Hours)			:	70		

Prerequisites:NONE
CourseObjective:
CO1: Thiscoursewillintroducethetheoreticalfoundations,algorithms.
CO2:Tounderstandmethodologies,andapplicationsofneuralnetworksanddeeplearning.
CO3: Itwillhelptodesignanddevelop application-specificdeeplearningmodels
CO4: Itleadstoprovidethepracticalknowledge handlingand analyzingrealworldapplications.
CourseOutcomes(COs): Attheend ofthecourse, studentswillbeableto
CLO1: Understandthe fundamental issues and basics of machine learning.
CLO2:D ifferentiatemachinelearningwithdeeplearningtechniques
CLO3:Understand the concept of CNN andtransfer learningtechniques.
CLO4:LearnedtouseRNNforlanguagemodellingandtimeseriesprediction.

SYLLABUS

UNIT– I

MachineLearningBasics: Learningalgorithms,Maximumlikelihoodestimation,Buildingmachinelearningalgorithm,NeuralNetworksMultilayerPerceptron,Back-propagationalgorithmandits variants Stochasticgradientdecent, Curse of Dimensionality.

UNIT– II

IntroductiontoDeepLearning&Architectures:MachineLearningVs.DeepLearning,Representation Learning, Width Vs. Depth of Neural Networks, Activation Functions: RELU,LRELU, ERELU, Unsupervised Training of Neural Networks, Restricted Boltzmann Machines,AutoEncoders.

UNIT– III

Convolutional Neural Networks: Architectural Overview – Motivation - Layers – Filters – Parametersharing–Regularization, PopularCNNArchitectures: ResNet,AlexNet.
TransferLearning: TransferlearningTechniques,Variants ofCNN:DenseNet,PixelNet.

UNIT– IV

SequenceModelling–
RecurrentandRecursiveNets: RecurrentNeuralNetworks,BidirectionalRNNs – Encoder-decoder sequence to sequence architechures - BPTT for training RNN, LongShortTerm MemoryNetworks.
AutoEncoders: UndercompleteAutoencoders–RegulraizedAutoencoders–stochasticEncodersandDecoders –ContractiveEncoders.

TEXT BOOKS:

1. IanGoodfellow,YoshuaBengioandAaronCourville,“DeepLearning”,MITPress,2017.
2. UmbertoMichelucci“AppliedDeepLearning.ACase-basedApproachtoUnderstandingDeepNeuralNetworks”Apress,2018.

REFERENCEBOOKS:

1. AntonioGulli,SujitPal"DeepLearningwithKeras",PacktPublishers,2017.
2. FrancoisChollet"Deep LearningwithPython",ManningPublications,2017.

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IndustrialManagementandEntrepreneurshipDevelopment–HSS
IVB. Tech– I Semester(20EC704/HS02)

Lectures	3	Tutorial		0	Practical	0	Credits		3		
ContinuousInternalAssessment			:	30	SemesterEndExamination(3Hours)			:	70		

Prerequisites: None

CourseObjectives:
CO1: To provide students an insight into the concepts of general, scientific management andVariousformsofbusinessorganizationsalongwithawarenessaboutvariousorganizationStructures.
CO2: Itaimsto providethestudentswith anunderstandingof basicsofhumanresourceManagement,marketingmanagement.
CO3: Tomakethestudentstounderstandinventorycontrol concepts,fundamentalsofTQM, andSupplychainmanagement.
CO4: To provide an understanding of financial management and realize the importance ofEntrepreneurship.

CourseOutcomes: Aftercompletion ofthecourse, thestudentmust beableto
CLO1: Describethevarious functionsofthemanagement.Learnvariousforms andstructuresofBusinessorganizations.
CLO2: Understand how resources to be planned and understand various motivation theories,Leadershipstylesand marketingmanagement.
CLO3: Developknowledgeaboutinventorycontrol.Gaintheknowledge on TotalqualityManagementandunderstand supplychainmanagement.
CLO4: Graspcomplete knowledgeonimportanceofentrepreneurshipand abilitytounderstandCapital and various types ofcapital.

SYLLABUS

UNIT– I

General Management: Management definition, Functions of Management and Principles ofManagement.
ScientificManagement: Definition,PrinciplesofScientificManagement.
Forms of Business Organization: Choice of form of organization, Salient features of SoleProprietorship,Partnership,JointStockCompany:PrivateLimitedandPublicLimitedcompanies;Cooperativesocieties,Publicsectororganizations,Stateownership,Publiccorporation,Merit sanddemeritsof abovetypes.**Introductionto Strategic Management.**

UNIT– II

HumanResourceManagement:FunctionsofHRmanagement,humanresourceplanning,recruitment,selection,placement,training&developmentandperformanceappraisal,Motivationtheories,leadership styles.
MarketingManagement: ConceptsofSellingandMarketing,FunctionsofMarketing,Marketingmix(4Ps); Advertisingand sales promotion;Product lifecycle;distribution channels.

UNIT– III

MaterialsManagement:InventoryControl,Inventorycosts,BasicEOQmodel,ModelwithPrice breaks,ABC analysis, FSN Analysis, VEDAnalysis.
TotalQualityManagement:Importanceofquality,DifferencebetweenInspectionandQualityco ntrol,Components of total quality, QualityFunction Deployment
IntroductiontoSupplyChainManagement

UNIT– IV

Financial Management: Functions of finance, Types of Capital-Fixed and Working Capital,BreakEven Analysis.
Entrepreneurship Development: Introduction, Entrepreneurial characteristics, Functions of anEntrepreneur; Factors affecting entrepreneurship; Role of communication in entrepreneurship;Entrepreneurialdevelopment-
Objectives,NeedofTrainingforenterprises;Financefortheenterprises.

TEXTBOOKS:

1. ManagementScience,A.R.Aryasri.
2. IndustrialEngineeringand productionmanagement byMMahajan, DhanapatraiPublications.

REFERENCEBOOKS:

1. EssentialsofManagement/Koontz andHeinzWeihrich/Tata-McGraw-Hill10thEd.
2. ManufacturingOrganizationandManagement/Amrine/Pearson Education.
3. MarketingManagement, Philip Kotler.

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ArtificialNeuralNetworks -SOC
IVB.Tech – ISemester(20EC705/SO03)

Lectures	1	Tutorial	0	Practical	2	Credits	2
ContinuousInternalAssessment	:	30	SemesterEndExamination(3Hours)			:	70

Prerequisites: None
Course Objectives: To learn
CO1: The basic understanding of neural networks and Neural Network Architectures.
CO2: Classification of patterns and patterns association.
CO3: Implementation of competitive neural nets and back propagation algorithm.
Course Outcomes: Students will be able to
CLO-1: Illustrate the functionality of Artificial Neural Model for different structures and activation functions.
CLO-2: Design the characteristics ofpattern classification and pattern associators.
CLO-3: Design different types of competitive neural networks.

SYLLABUS

UNIT – I

ARTIFICIAL NEURAL NETWORKS: BASIC CONCEPTS: Introduction, Computation in terms of patterns, The McCulloch-Pitts Neural Model, The Perceptron, Neural Network Architectures, Activation Functions, Learning by Neural Nets.

UNIT – II

PATTERN CLASSIFIERS: Hebb Nets, Perceptron, Adaline, Madaline
PATERN ASSOCIATORS: Auto-associative Nets, Hetero-Associative Nets, Hopfield Networks, Bi-directional Associative Memory.

UNIT – III

COMPETITIVE NEURAL NETS: The MAXNET, Kohonen's Self Organizing Map (SOM), Learning Vector Quantization (LVQ), Adaptive Resonance Theory (ART).

UNIT – IV

BACKPROPAGATION: Multilayer Feed forward Net, The Generalized Delta Rule, The Back propagation Algorithm

Practical Exercises

1. Write a program to generate the activation functions that are being used in Neural Networks.
2. Write a program to realize the ANDNOT function using McCulloch-Pitts neural net.
3. Write a program to cluster the given samples using unsupervised learning (winner takes all algorithm).
4. Write a program to realize the logical AND with a neural net that learns the desired function through Hebb learning.
5. Write a program to realize the logical AND with a neural net that learns the desired function through Perceptron learning.
6. Write a program to realize the logical AND with a neural net that learns the desired function through LMS learning.
7. Write a program to realize a logical function with the help of ADALINE Learning.

8. Write a program to realize a logical function with the help of MADALINE Learning (XOR problem).
9. Write a program to implement an auto-associative net to store the patterns [-1 -1 -1 -1] and [-1 -1 1 1]. Test the performance of the net with the test patterns [-1 -1 -1 -1] (stored pattern), [1 1 1 1] (unknown pattern.)
10. Write a program to implement a hetero-associative net to map four patterns [1 1 0 0], [0 1 0 0], [0 0 1 1] and [0 0 1 0] to two output patterns [1 0], [0 1] so that patterns [1 1 0 0] and [0 1 0 0] are associated with [1 0] and the patterns [0 0 1 1], and [0 0 1 0] are associated with [0 1].
11. Write a program to find weight matrix in bipolar form for the bi-directional Associative memory (BAM) network based on the following binary input output pairs.

$$S(1) = (1\ 1\ 0) \longleftrightarrow t(1) = (1\ 0)$$
$$S(2) = (1\ 0\ 1) \longleftrightarrow t(2) = (0\ 1)$$

12. Write a program for clustering the vectors by using Kohonen's SOM network.
13. Write a program for clustering the following vectors into two clusters by using an LVQ net.

Vector	Class
(1 1 0 0)	1
(0 0 0 1)	2
(0 0 1 1)	2
(1 0 0 0)	1
(0 1 1 0)	2

14. Write a program for clustering the vectors by using ART-1 neural network.
15. Write a program to implement XOR function with momentum factor using back propagation algorithm.

TEXT BOOK:

1. Introduction to SOFT COMPUTING by Samir Roy and UditChakraborty, Pearson Publishing, 2013.

REFERENCE BOOKS:

1. Introduction to Neural Networks using Matlab 6.0 by S N Sivanandam,SSumathi, S N Deepa,Tata McGraw Hill Publishing,7th Reprint, 2008
2. J.M. Zurada Introduction to Artificial Neural Systems, Jaico Publications.
3. B. Yegnanarayana, Artificial Neural Networks, PHI, New Delhi.
4. Waserman: Neural Computing – Theory and Practice.
5. KishanMehrotra, Chelkuri K. Mohan, SanjavRanka, elements of Artificial Neural Networks, Tenram International.

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OPEN ELECTIVES OFFERED BY DIFFERENT DEPARTMENTS AT COLLEGE LEVEL

Department	Subject Code	Title of the subject	No of seats
EIE	20EIOE01	Sensors And Signal Conditioning.	60
IT	20ITOE01	Web Technologies	60
	20ITOE02	Cyber Security	60
Mech	20MEOE01	Automobile Engineering	120
	20MEOE02	Renewable Energy Sources	120
English	20ELOE01	Professional Communication	120
CSE	20CSOE01	Database Management System	60
	20CSOE02	Java Programming	60
ECE	20ECOE01	Digital Image Processing	60
Civil	20CEOE01	Air Pollution and Control	60
	20CEOE02	Remote Sensing and GIS	60
EEE	20EEOE01	Non-Conventional Energy Sources	120
	20EEOE02	Electrical Energy Conservation and Auditing	60
Physics	20PHOE01	Nano Materials	60
	20PHOE02	Opto Electronic Devices and Applications	60
	20PHOE03	Fiber Optic Communications	60
Total no.of elective seats offered to students at college level			**1200**