Vision of the Institution

To ignite the minds of the students through academic excellence so as to bring about social transformation and prosperity.

Mission of the Institution

- To expand the frontiers of knowledge through Quality Education.
- To provide valued added Research and Development.
- To embody a spirit of excellence in Teaching, Creativity, Scholarship and Outreach.
- To provide a platform for synergy of Academy, Industry and Community.
- To inculcate high standards of Ethical and Professional Behavior.

Vision of ECE Department

In pursuit of world class excellence in the field of Electronics& Communication Engineering by imparting quality education and promoting Research.

Mission of ECE Department

- To empower students with knowledge and competencies in the field of Electronics & Communication Engineering conforming to International standards.
- To produce creative solutions essential to local and global needs in the field of Electronics & Communication Engineering.
- To mould the students professionally with a consciousness of moral values and professional ethical code**.**

Program Educational Objectives (PEOs) of ECE Department

PEO1: To provide world class Education in the principles of engineering that incorporate open ended design experience and the use of software and hardware tools related to Electronics and Communication Engineering and hence improve the employability skills of the student.

PEO2: To make the students able to function with multi-disciplinary teams that will enhance the leadership qualities and to formulate and solve engineering problems as a team which helps the student to adopt better professional conduct.

PEO3: To provide learning environment that provides open interaction for the students with faculty and staff that makes them innovative and dynamic and encourages research and motivate them to solve the problems of the society.

Program Outcomes (POs) of ECE Department

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs) of ECE Department

1. Will be equipped with knowledge of innovative, dynamic complete design flow specialized in implementation of projects pertaining to communication system, signal processing, digital and analog IC design, embedded systems and will integrate all areas to illustrate the goal of digital India.
2. Will have the ability to analyze, design electronics and communication applications using software tools like, pSpice, XYLINX, MATLAB, Mentor Graphics and other related software's.
3. Can demonstrate the principles of semiconductor devices, digital system, Microprocessor and microcontrollers, signal processing, antenna design in fields of consumer electronics, medical, defence and spacecraft electronics industry.
4. Will have strong ethical moral values and sound fundamental foundation of technical knowledge in all core subjects which help them to explore scientific theories, ideas, methods and technologies that help in solving current and future universal societal problems through Assistive Technology Laboratory as a flat form.

L	T	P	C
4	0	0	3

IV Year-ISemester **RADARSYSTEMS**

OBJECTIVES

Thestudentwillbeintroducedto:

1. TheBasicPrincipleofradarand radar rangeequation.
2. Differenttypesofradars; CW,FM-CW,MTIandpulseDopplerradars.
3. Understandthedifferenttrackingtechniquesforradar.
4. Understandthe characteristicsofamatchedfilterreceiveranditsperformance.
5. Understandthedifferenttypesofdisplays,duplexers and antennasusedin radarsystems.

UNIT–I:

Basics of Radar : Introduction, Maximum Unambiguous Range,simple Radar range Equation, Radar BlockDiagramandOperation,RadarFrequenciesandApplications.PredictionofRangePerformance,MinimumDetectableSignal, ReceiverNoise,IllustrativeProblems.

Radar Equation : Modified Radar Range Equation, SNR, probability of detection, probability of False Alarm,Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Creeping Wave,TransmitterPower,PRFandRangeAmbiguities,System Losses(qualitativetreatment),IllustrativeProblems.

UNIT–II:

CWandFrequencyModulatedRadar: DopplerEffect,CWRadar–BlockDiagram,IsolationbetweenTransmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar.IllustrativeProblems

FM-CWRadar: RangeandDopplerMeasurement,BlockDiagramandCharacteristics,FM-CWaltimeter,MultipleFrequencyCWRadar.

UNIT-III:

MTI and Pulse Doppler Radar: Introduction, Principle, MTI Radar with - Power Amplifier Transmitter andPower Oscillator Transmitter, Delay Line Cancellers– Filter Characteristics, Blind Speeds, Double Cancellation,N^{th}CancellationStaggeredPRFs.RangeGatedDopplerFilters.MTIRadarParameters,LimitationstoMTIPerformance,MTIversus PulseDopplerRadar.

UNIT–IV:

Tracking Radar: Tracking with Radar, Sequential Lobing, Conical Scan, Mono pulse Tracking Radar – AmplitudeComparisonMonopulse(one-andtwo-coordinates),PhaseComparisonMonopulse,TrackinginRange,Acquisitionand ScanningPatterns, Comparison ofTrackers.

UNIT–V:

Detection of Radar Signals in Noise : Introduction, Matched Filter Receiver – Response Characteristics andDerivation, Correlation detection and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched FilterwithNon-whiteNoise, NoiseFigureand NoiseTemperature.

UNIT–VI:

RadarReceivers–Displays–types.Duplexers–BranchtypeandBalancedtype,CirculatorsasDuplexers.Introduction to Phased Array Antennas – Basic Concepts, Radiation Pattern, Beam Steering and Beam Widthchanges,Series versusparallel feeds,Applications, AdvantagesandLimitations.Radomes.

TEXTBOOKS:

1.IntroductiontoRadar Systems – MerrillI. Skolnik, TMHSpecialIndian Edition, 2nd Ed., 2007.

REFERENCEBOOKS:

1. IntroductiontoRadarSystems,3rd edition–M.I.Skolnik,TMHEd.,2005
2. Radar:Principles,Technology,Applications– ByronEdde,PearsonEducation,2004.
3. RadarPrinciples–Peebles,Jr.,P.Z.,Wiley,NewYork,1998.
4. PrinciplesofModernRadar:BasicPrinciples–MarkA.Richards,JamesA.Scheer,WilliamA.Holm,Yesdee,
5. RadarEngineering–GSNRaju, IKInternational.

OUTCOMES

Aftergoingthroughthiscoursethestudentwillbeableto:

1. Derivethe radarrangeequationandtosolvesomeanalyticalproblems.
2. Understandthedifferenttypesof radarsanditsapplications.
3. Understandthe conceptoftrackinganddifferenttrackingtechniques.
4. Understandthevariouscomponentsofradarreceiveranditsperformanc.

IVYear-I Semester	L	T	P	C
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DIGITALIMAGEPROCESSING

CourseObjectives:

Studentsundergoingthis courseareexpectedto:

1. Familiarizewithbasic conceptsofdigitalimageprocessinganddifferentimagetransforms
2. Learnvariousimageprocessingtechniqueslikeimage enhancement,restoration,segmentationandcompression
3. Understandcolorfundamentalsanddifferentcolormodels
4. Understandwaveletsandmorphologicalimageprocessing

UNIT-1

Introduction: Introduction to Image Processing, Fundamental steps in digital image processing, components of animage processing system, image sensing and acquisition, image sampling and quantization, some basic relationshipsbetweenpixels, an introductionto themathematicaltools used indigital imageprocessing.

Image Transforms: Need for image transforms, Discrete Fourier transform (DFT) of one variable, Extension tofunctions of two variables, some properties of the 2-D Discrete Fourier transform, Importance of Phase, WalshTransform. Hadamard transform, Haar Transform, Slant transform, Discrete Cosine transform, KL Transform, SVDandRadon Transform, Comparison ofdifferent imagetransforms

UNIT-2

Intensity Transformations and Spatial Filtering: Background, Some basic intensity transformation functions,histogramprocessing,fundamentalsofspatialfiltering,smoothingspatialfilters,sharpeningspatialfilters,Combiningspatial enhancement methods

Filtering in the Frequency Domain: Preliminary concepts, The Basics of filtering in the frequency domain, imagesmoothingusingfrequencydomainfilters,Image Sharpeningusing frequencydomain filters,Selectivefiltering.

UNIT-3

Image Restoration and Reconstruction: A model of the image degradation / Restoration process, Noise models,restoration in the presence of noise only-Spatial Filtering, Periodic Noise Reduction by frequency domain filtering,Linear, Position –Invariant Degradations, Estimating the degradation function, Inverse filtering, Minimum meansquare error (Wiener) filtering, constrained least squares filtering ,geometric mean filter ,image reconstruction fromprojections.

UNIT-4

Image compression: Fundamentals, Basic compression methods: Huffman coding, Golomb coding, Arithmeticcoding,LZWcoding,Run-Lengthcoding,Symbol-Basedcoding,Bit-Planecoding,BlockTransformcoding,Predictivecoding

Wavelets and Multiresolution Processing: Image pyramids, subband coding, Multiresolution expansions, wavelettransformsin onedimensions &two dimensions, Wavelet coding.

UNIT-5

Image segmentation: Fundamentals, point, line, edge detection, thresholding, region –based segmentation.**MorphologicalImageProcessing:** Preliminaries, Erosion and dilation, opening and closing, basicmorphologicalalgorithmsforboundaryextraction,thinning,gray scalemorphology,Segmentationusingmorphologicalwatersheds.

UNIT-6

Color image processing: color fundamentals, color models, pseudo color image processing, basics of full colorimage processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise incolorimages, colorimagecompression.

TextBooks

1. R.C.GonzalezandR.E.Woods,DigitalImageProcessing,3rdedition,PrenticeHall,2008.
2. Jayaraman,S.Esakkirajan,andT.Veerakumar,"DigitalImageProcessing",TataMcGraw-HillEducation,2011.

ReferenceBooks

1. AnilK.Jain,"FundamentalsofDigitalImageProcessing",PrenticeHallofIndia,9thEdition,IndianReprint,2002.
2. B.Chanda,D.DuttaMajumder,"Digital ImageProcessingandAnalysis",PHI,2009.

CourseOutcomes:

Afterundergoingthecoursestudents will beableto

1. Performimagemanipulationsanddifferentdigitalimageprocessingtechniques
2. Performbasicoperationslike– Enhancement,segmentation,compression,Imagetransformsandrestorationtechniqueson image.
3. Analyzepseudoandfullcolorimageprocessingtechniques.
4. Applyvariousmorphologicaloperators onimages

IVYear-I Semester

L	T	P	C
4	0	0	3

COMPUTERNETWORKS

OBJECTIVES:

- Understandstate-of-the-artinnetworkprotocols,architectures,andapplications.
- Processofnetworkingresearch
- Constraintsandthought processes fornetworkingresearch
- ProblemFormulation—Approach—Analysis—

UNIT–I

Introduction: Network Topologies WAN, LAN, MAN. Reference models- The OSI Reference Model- the TCP/IPReferenceModel -AComparison oftheOSIandTCP/IP ReferenceModels

UNIT–II

Physical Layer – Fourier Analysis – Bandwidth Limited Signals – The Maximum Data Rate of a Channel - GuidedTransmissionMedia,DigitalModulationandMultiplexing:FrequencyDivisionMultiplexing,TimeDivisionMultiplexing,CodeDivision Multiplexing

Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding WindowProtocols

UNIT–III

The Data Link Layer - Services Provided to the Network Layer – Framing – Error Control – Flow Control, ErrorDetection and Correction – Error-Correcting Codes – Error Detecting Codes, Elementary Data Link Protocols-AUtopian Simplex Protocol-A Simplex Stop and Wait Protocol for an Error free channel-A Simplex Stop and WaitProtocol for a Noisy Channel, Sliding Window Protocols-A One Bit Sliding Window Protocol-A Protocol UsingGo-Back-N-AProtocolUsingSelectiveRepeat

UNIT–IV

The Medium Access Control Sublayer-The Channel Allocation Problem-Static Channel Allocation-Assumptions forDynamic Channel Allocation, Multiple Access Protocols-Aloha-Carrier Sense Multiple Multiple Access Protocols-Collision-Free Protocols-Limited Contention Protocols-Wireless LAN Protocols, Ethernet-Classic Ethernet PhysicalLayer-Classic Ethernet MAC Sublayer Protocol-Ethernet Performance-Fast Ethernet Gigabit Ethernet-10-GigabitEthernet-RetrospectiveonEthernet,WirelessLans-The802.11ArchitectureandProtocolStack-The802.11PhysicalLayer-The802.11 MACSublayerProtocol-The805.11 FrameStructure-Services

UNIT–V

Design Issues-The Network Layer Design Issues – Store and Forward Packet Switching-Services Provided to theTransportlayer-ImplementationofConnectionlessService-ImplementationofConnectionOrientedService-Comparison of Virtual Circuit and Datagram Networks, Routing Algorithms-The Optimality principle-ShortestpathAlgorithm,CongestionControlAlgorithms-ApproachestoCongestionControl-TrafficAwareRouting-AdmissionControl-TrafficThrottling-Load Shedding.

UNIT–VI

TransportLayer–TheInternetTransportProtocols:Udp,theInternetTransportProtocols:Tcp

ApplicationLayer–

TheDomainNameSystem:TheDNSNameSpace,ResourceRecords,NameServers,ElectronicMail:ArchitectureandServices,TheUserAgent,Message Formats,MessageTransfer,FinalDelivery

OUTCOMES:

- UnderstandOSIandTCP/IPmodels
- AnalyzeMAClayerprotocolsand LANtechnologies
- 3.Design applicationsusinginternetprotocols
- 4.Understandroutingandcongestioncontrolalgorithms
- 5.Understandhowinternetworks

TEXTBOOKS:

1. ComputerNetworks,TanenbaumandDavidJWetherall,5thEdition,PearsonEdu,2010
2. ComputerNetworks:ATopDownApproach,BehrouzA.Forouzan,FirouzMosharraf,McGrawHillEducation

REFERENCEBOOKS:

1.LarryL.PetersonandBruceS.Davie,“ComputerNetworks-ASystemsApproach”(5thed),MorganKaufmann/Elsevier, 2011

IVYear-I Semester

L	T	P	C
4	0	0	3

OPTICALCOMMUNICATIONS

OBJECTIVES

Thestudentwillbeintroducedtothefunctionalityofeachofthecomponentsthatcompriseafiber-opticcommunicationsystem

- thepropertiesofopticalfiberthataffecttheperformanceofacommunicationlinkandtypesoffibermaterialswith theirproperties and thelosses occurinfibers.
- theprinciplesofsingleandmulti-modeopticalfibersandtheircharacteristics
- workingofsemiconductorlasers,anddifferentiatebetweendirectmodulationandexternalelectro-opticmodulation.
- Analyze the operation of LEDs, laser diodes, and PIN photo detectors (spectralproperties,bandwidth, and circuits)and applyin opticalsystems.
- Analyzeanddesignopticalcommunicationandfiberopticsensorsystems.
- themodelsofanalogganddigitalreceivers.

UNITI

Overview of optical fiber communication - Historical development, The general system, advantages of optical fibercommunications.Opticalfiberwaveguides-Introduction,Ray theorytransmission,TotalInternalReflection,Acceptance angle, Numerical Aperture, Skew rays, Cylindrical fibers-Modes, V-number, Mode coupling, StepIndexfibers,GradedIndexfibers,Singlemodefibers-Cutoffwavelength,ModeFieldDiameter,EffectiveRefractiveIndex, Related problems.

UNITII

Fiber materials:- Glass, Halide, Active glass, Chalgenide glass, Plastic optical fibers. Signal distortion in opticalfibers-Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses, Information capacitydetermination, Group delay, Types of Dispersion:- Material dispersion, Wave-guide dispersion, Polarization-Modedispersion,Intermodal dispersion,Pulsebroadeningin Graded indexfiber,Relatedproblems.

UNITIII

. Optical fiber Connectors-Connector types, Single mode fiber connectors, Connector return loss, Fiber Splicing-Splicing techniques, Splicing single mode fibers, Fiber alignmentand jointloss- Multimode fiber joints, singlemodefiberjoints.

UNITIV

Optical sources- LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product.Injection Laser Diodes- Modes, Threshold conditions, External quantum efficiency, Laser diode rate equations,Resonant frequencies, Reliability of LED&ILD, Optical detectors- Physical principles of PIN and APD, Detectorresponsetime,Temperatureeffecton Avalanche gain, ComparisonofPhotodetectors, Relatedproblems.

UNITV

Source to fiber power launching - Output patterns, Power coupling, Power launching, Equilibrium NumericalAperture, Laser diode to fiber coupling, Optical receiver operation- Fundamental receiver operation, Digital signaltransmission, error sources, Receiver configuration, Digital receiver performance, Probability of Error, Quantumlimit,Analogreceivers.

UNITVI

Optical system design - Point-to- point links- Component choice and considerations, Link power budget, Rise timebudget with examples, Line coding in Optical links, WDM, Necessity, Principles, Measurement of Attenuation andDispersion,Eyepattern.

TEXTBOOKS:

1. OpticalFiberCommunications–GerdKeiser, McGraw-HillInternationaledition,3rdEdition,2000.
2. OpticalFiberCommunications–JohnM.Senior,PHI,2ndEdition,2002.

RERFERENCES:

1. FiberOpticCommunications–D.K.Mynbaev ,S.C.GuptaandLowellL.Scheiner,PearsonEducation,2005.
2. TextBookonOpticalFiberCommunicationanditsApplications–S.C.Gupta,PHI,2005.
3. FiberOpticCommunicationSystems–GovindP.Agarwal,JohnWiley,3rdEdiition,2004.
4. FiberOpticCommunications–JosephC.Palais,4thEdition,PearsonEducation,2004.

OUTCOMES

After goingthroughthiscoursethestudentwillbe ableto

- Choosenecessarycomponents requiredinmodern opticalcommunicationssystems.
- Designandbuildopticalfiberexperimentsinthelaboratory,andlearnhowtocalculateelectromagneticmodesinwave guides,theamountoflightlostgoingthroughanopticalsystem,dispersionofopticalfibers.
- Usedifferenttypesofphotodetectorsandopticaltestequipmenttoanalyzeopticalfiberandlightwavesystems.
- Choosethe optical cables for better communication with minimum lossesDesign,build,anddemonstrateopticalfiberexperimentsinthelaboratory

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IVYear-I Semester

L	T	P	C
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TELEVISIONENGINEERING
(Elective-I)

UNITI

INTRODUCTION: TV transmitter and receivers, synchronization. Television Pictures: Geometric form and aspectratio,imagecontinuity,interlacedscanning,pictureresolution,Compositevideosignal:Horizontalandverticalsync, scanning sequence, Colour signal generation and Encoding: Perception of brightness and colours, additivecolour mixing, video signals for colours,luminance signal, colour difference signals, encoding of colour differencesignals,formation ofchrominancesignals, PALencoder.

UNITII

TVSIGNALTRANSMISSIONANDPROPAGATION: Picturesignaltransmission,positiveandnegativemodulation, VSBtransmission,soundsignaltransmission,standardchannelBW,TVtransmitter,TVsignalpropagation,interference, TVbroadcast channels.

MONOCHROME TV RECEIVER: RF tuner, IF subsystem, video amplifier, sound section, sync separation andprocessing,deflection circuits, scanning circuits.

PAL–D colour receiver: Electron tuners, IF subsystem, Y-signal channel, chroma decoder, separation of U & VColourphasors, synchronous demodulators, subcarriergeneration,rastercircuits.

UNITIII

VISION IF SUBSYSTEM: AGC, noise cancellation, video and intercarrier sound signal detection, Colour receiverIF subsystem, Receiver sound system: FM detection, FM Sound detectors, typical applications.TV Receiver Tuners:Tuneroperation, VHFand UHFtuners.

COLOUR SIGNAL DECODING:PAL-D decoder, chroma signal amplifiers, separation of U and V signals, Colorburst separation, Burst phase discriminator, Reference oscillator, Indent and color killer circuits, RO phase shift and180degrees PAL-SWITCHcircuitry,U&Vdemodulators, Coloursignal mixing.

UNIT-IV

HISTORY OF HDTV: Analog and Digital TV Compared, Going HD,Broadcast Engineering and InformationTechnology, The Road to HDTV, The Grand Alliance, A DTV Standard at Last, Producing HDTV, HD GoesCoast-to-Coast,DTVConversion.

COMPRESSIONTECHNIQUES: Compression,MPEG-2VideoCompression,MPEG-4,H.264,Motion–JPEG(M-JPEG)compression, AudioCompression, CompressedDataStreams,PacketizedTransport.

UNITV

DTVTRANSMITTERANDRECIEVER: EngineeringBasics,Presentation,Transmission,ReceptionandDemodulation,TransportStreamDemultiplexing,DecodingandDecompression,ProgramAssemblyandPresentation,ReceiverIssues, Presentation Concerns.

HDTVANDDTVSTANDARDS: StandardsBodies,TheATSCStandards,SMPTEStandards,TheAudioEngineeringSociety,CableDTVStandards,InstituteofElectronicandElectricalEngineers,TheConsumerElectronicsAssociation,OtherSocieties and Organizations.

UNITVI

EMERGING TECHNOLOGIES AND STANDARDS: Technology and Standards Development, Presentation,DeliveryandDistribution,MPEGandMetadata,Enhanced,InteractiveandPersonalized,VirtualProductPlacement,Multiplatform EmergencyAlert System.

TEXTBOOKS

1. ModernTelevisionPractice–Principles,TechnologyandService– R.R.Gulati,NewAgeInternationalPublication,2002

2. TelevisionandVideoEngineering–A.M.Dhake,2nd Edition,

3. "HDTVand the Transition to DigitalBroadcasting: UnderstandingNew Television Technologies"byPhilip J.Cianci,FocalPress,2007.

4. "DigitalVideoandHDTVAlgorithmsandInterfaces"byCharlesPoynton,MorganKaufmanpublishers,2007.

REFERENCES

1. BasicTelevisionandVideoSystems– B.Groband C.E.Herndon,McGrawHill,1999

2. "NewnesGuidetoTelevisionandVideoTechnology"byIbrahim.K.F,NewnesPublishers,4thedition,2007.

3. "H.264andMPEG-4andVideocompressionvideocodingforNext-generationMultimedia"byIainE.G.Richardson,JohnWiley&SonsLtd., 2003.

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ELECTRONICSWITCHINGSYSTEMS
(Elective-I)

OBJECTIVES:
Thestudentwill

- Understandthemeansof measuringtraffic.
- Understandtheimplicationofthetrafficlevelon systemdesign.

UNIT-I:
Introduction: Evolution of Telecommunications, Simple Telephone Communication, Basics of Switching System,ManualSwitchingSystem, MajorTelecommunication Networks.
CrossbarSwitching: PrinciplesofCommonControl,TouchToneDialTelephone,PrinciplesofCrossbarSwitching,CrossbarSwitchConfigurations, CrosspointTechnology, CrossbarExchangeOrganization.

UNIT-II:
Electronic Space Division Switching: Stored Program Control, Centralized SPC: Stand by mode, Synchronousduplexmode,DistributedSPC,SoftwareArchitecture,ApplicationSoftware,EnhancedServices,Two-StageNetworks,Three-StageNetworks, n-StageNetworks.

UNIT-III
TimeDivisionSwitching: BasicTimeDivisionSpaceSwitching,BasicTimeDivisionTimeSwitching,Generalised time division Space switch, Basic Time division time switching: modes of operation, simple problems,TimeMultiplexedSpaceSwitching,TimeMultiplexedTimedivisionspaceSwitch,TimeMultiplexedTimeSwitching,CombinationSwitching:TimeSpace(TS)Switching,Space-time(ST)Switching,Three-StageCombinationSwitching, n-StageCombination Switching.

UNITIV
TelephoneNetworks: SubscriberLoopSystem,SwitchingHierarchyandRouting,TransmissionPlan,Transmission Systems, Numbering Plan, Charging Plan, Signaling Techniques, In-channel Signaling, CommonChannel Signaling, CCITT Signaling System no.6, CCITT Signaling System no.7, **Packet Switching:** StatisticalMultiplexing,Local-AreaandWide-AreaNetworks,Large-scaleNetworks,Broadband Networks.

UNIT-V:
SwitchingNetworks: Single-StageNetworks,Grading,LinkSystems,Gradesofserviceoflinksystems,ApplicationofGraph Theoryto link Systems, UseofExpansion, Call Packing,
Rearrange-able Networks, Strict- Sense non-blocking Networks, Sectionalized Switching Networks**TelecommunicationsTraffic:**TheUnitofTraffic,Congestion,TrafficMeasurement,AMathematicalModel,Lost-callSystems, QueuingSystems. Problems

UNIT-VI:
Integrated Services Digital Network: Motivation for ISDN, New Services, Network and Protocol Architecture,Transmission Channels, User- Network Interfaces, Signaling, Numbering and Addressing, Service Characterization,Interworking, ISDNStandards,ExpertSystemsinISDN,BroadbandISDN,VoiceData Integration.

TEXTBOOKS:
1. TelecommunicationSwitchingSystemsandNetworks-ThiagarajanViswanathan,2000,PHI.
2. TelecommunicationsSwitching,TrafficandNetworks-J.E.Flood,2006,PearsonEducation.

REFERENCES:

1. DigitalTelephony-J.Bellamy,2ndEdition,2001,JohnWiley.
2. DataCommunicationsandNetworks-AchyutS.Godbole,2004,TMH.
3. PrinciplesofCommunicationStstems-H.Taub&D.Schilling,2ndEdition,2003,TMH.
4. DataCommunication&Networking- B.A.Forouzan,3rdEdition,2004,TMH.
5. TelecommunicationSystemEngineering–RogerL.Freeman,4thEd.,Wiley-InterScience,JohnWiley&Sons,2004.

Outcomes

Thestudent will beableto

- Evaluatethetimeandspaceparametersof aswitchedsignal
- Establishthedigitalsignalpathintimeandspace, betweentwoterminals
- EvaluatetheinherentfacilitieswithinthesystemtotestsomeoftheSLIC,CODECanddigitalswitchfunctions.
- Investigatethetrafficcapacityofthesystem.
- Evaluatemethodsofcollectingtrafficdata.
- Evaluatethemethodofinterconnectingtwoseparatedigitalswitches.

SYSTEMDESIGNTHROUGHVERILOG
(Elective-I)

UNIT-I
INTRODUCTIONTOVERILOG:
VerilogasHDL,
Levelsofdesigndescription,concurrency,simulationandsynthesis,functionalverification,systemtasks,programminglanguageinterface(PLI),module,simulationand synthesistools,testbenches.
LANGUAGECONSTRUCTSANDCONVENTIONS:
Introduction, keywords, identifiers, whitespace characters, comments, numbers, strings, logic values, data types,scalarsand vectors, parameters, memory, operators, systemtasks.

UNIT-II
GATELEVELMODELLING:
Introduction, AND gate primitive, module structure, other gate primitives, illustrative examples, tristate gates, arrayof instances of primitives, design of Flip flops with gate primitives, delays, strengths and contention resolution, nettypes,design ofbasiccircuits.

UNIT-III
BEHAVIORALMODELLING:
Introduction, operationsand assignments, functional Bifurcation, initial construct, alwaysconstruct, examples,assignments with delays, wait construct, multiple always blocks, designs at behavioral level, blocking and non-blocking assignments, the case statement, simulation flow, if and if else constructs, assign-De assign construct,repeat construct, FOR loop, the disable construct, While loop, Forever loop, parallel blocks, force-release construct,event.

UNIT-IV
DATAFLOWLEVELANDSWITCHLEVELMODELLING:
Introduction, continuous assignment structures, delays and continuous assignments, assignment to vectors, basictransistor switches, CMOS switch, Bidirectional gates and time delays with switch primitives, instantiations withstrengthsand delays, strength contention with triregnets.

UNIT-V
SYNTHSISOFCOMBINATIONALANDSEQUENTIALLOGICUSINGVERILOG: Synthesisof
combinational logic: Net list of structured primitives, a set of continuous assignment statements and level sensitivecyclic behavior with examples, Synthesis of priority structures, Exploiting logic don't care conditions. Synthesis ofsequential logic with latches: Accidental synthesis of latches and Intentional synthesis of latches, Synthesis ofsequentiallogicwith flip-flops, Synthesis ofexplicit statemachines.

UNIT-VI
VERILOGMODELS:
Static RAM Memory, A simplified 486 Bus Model, Interfacing Memory to a Microprocessor Bus, UART DesignandDesign ofMicrocontrollerCPU.

TEXTBOOKS:

1. Designthrough VerilogHDL–T.R.PadmanabhanandB. BalaTripuraSundari,WSE,IEEEPress, 2004.
2. Advanced DigitalDesign withVerilogHDL–MichaelD.Ciletti,PHI,2005.

REFERENCES:

1. FundamentalsofLogic Design withVerilog–Stephen.BrownandZvonkoVranesic,TMH,2005.
2. AVerilogPrimier–J.Bhasker,BSP,2003.

IVYear-I Semester

L	T	P	C
4	0	0	3

EMBEDDED SYSTEMS
ELECTIVE-II

OBJECTIVES:

Themainobjectivesofthiscoursearegivenbelow:

- Thebasicconceptsof anembeddedsystemareintroduced.
- Thevariouselementsof embeddedhardwareandtheirdesignprinciplesareexplained.
- Differentstepsinvolvedinthedesignanddevelopmentoffirmwareforembeddedsystemsiselaborated.
- InternalsofReal-Timeoperating systemandthefundamentalsofRTOSbasedembeddedfirmwaredesignisdiscussed.
- Fundamentalissuesinhardwaresoftwareco-designwerepresented andexplained.
- FamiliarisewiththedifferentIDEsforfirmwaredevelopmentfordifferentfamilyofprocessors/controllersandembedded operating systems.
- Embeddedsystemimplementationandtestingtoolsareintroducedanddiscussed.

Syllabus

UNIT-I
INTRODUCTION: Embeddedsystem-Definition,historyofembeddedsystems,classificationofembeddedsystems,majorapplicationareasofembedded systems,purposeofembeddedsystems,thetypicalembeddedsystem-coreoftheembeddedsystem,Memory,SensorsandActuators,CommunicationInterface,Embeddedfirmware, Characteristics of an embedded system, Quality attributes of embedded systems, Application-specific andDomain-Specific examples ofan embedded system.

UNIT-II
EMBEDDED HARDWARE DESIGN: Analog and digital electronic components, I/O types and examples, Serialcommunication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Realtimeclock.

UNIT-III

EMBEDDEDFIRMWAREDESIGN: EmbeddedFirmwaredesignapproaches,EmbeddedFirmwaredevelopment languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA,Devicedriverprogramming,ConceptsofCversusEmbeddedC andCompilerversusCross-compiler.

UNIT-IV

REAL TIME OPERATINGSYSTEM: Operating system basics, Types of operating systems, Tasks, Process andThreads,MultiprocessingandMultitasking,TaskScheduling,Threads,ProcessesandScheduling,Taskcommunication ,Task synchronisation, DeviceDrivers.

HARDWARE SOFTWARE CO-DESIGN: Fundamental Issues in Hardware Software Co-Design, Computationalmodelsinembeddeddesign,HardwaresoftwareTrade-offs,Integrationof Hardware andFirmware,ICE.

UNIT-V

EMBEDDED SYSTEM DEVELOPMENT: The integrated developmentenvironment, Typesof filesgeneratedoncross-compilation,Deassembler/Decompiler,Simulators,EmulatorsandDebugging,Targethardwaredebugging,BoundaryScan, Embedded Softwaredevelopmentprocess andtools.

UNIT-VI

EMBEDDED SYSTEM IMPLEMENTATION AND TESTING: The main software utility tool, CAD and thehardware,Translationtools-Pre-processors,Interpreters,CompilersandLinkers,Debuggingtools,Qualityassuranceand testingofthedesign,Testingon host machine, Simulators,LaboratoryTools.

TextBooks:

1. EmbeddedSystemsArchitecture-ByTammyNoergaard,ElsevierPublications,2013.
2. EmbeddedSystems-ByShibu.K.V-TataMcGraw HillEducationPrivate Limited,2013.

References:

1. EmbeddedSystemDesign,FrankVahid,TonyGivargis,JohnWileyPublications,2013.
2. EmbeddedSystems-Lyla B.Das-PearsonPublications,2013.

Outcomes:

Attheendof thiscoursethestudentcanableto:

- Understandthebasicconceptsofanembeddedsystemandabletoknowanembeddedsystemdesignapproachto perform aspecificfunction.
- Thehardwarecomponentsrequiredforanembeddedsystemandthedesignapproachofanembeddedhardware.
- Thevariousembeddedfirmwaredesignapproachesonembeddedenvironment.
- Understandhowtointegratehardwareandfirmwareofanembeddedsystemusingrealtimeoperatingsystem.

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ANALOG IC DESIGN

ELECTIVE-II

OBJECTIVES

Thestudentwillbeintroducedto

- ThestudentwillbeabletounderstandthebehaviorofMOSDevicesandSmall-Signal&Large-SignalModelingofMOS Transistorand AnalogSub-Circuits.
- Inthiscourse,studentscanstudy CMOSAmplifierslikeDifferentialAmplifiers,CascodeAmplifiers,OutputAmplifiers, and Operational Amplifiers.
- AnothermainobjectofthiscourseistomotivatethegraduatestudentstodesignandtodeveloptheAnalogCMOSCircuits fordifferent Analogoperations.
- TheconceptsofOpen-LoopComparatorsandDifferentTypesofOscillatorslikeRingOscillator,LCOscillatoretc.

UNIT-I:

MOS Devices and Modeling: The MOS Transistor, Passive Components- Capacitor & Resistor, Integrated circuitLayout, CMOS Device Modeling - Simple MOSLarge-Signal Model, Other ModelParameters, Small-SignalModelfortheMOSTransistor, ComputerSimulation Models,Sub-threshold MOS Model.

UNIT-II:

Analog CMOS Sub-Circuits: MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources,CurrentMirrors-CurrentmirrorwithBetaHelper,Degeneration,CascodecurrentMirrorandWilsonCurrentMirror,Currentand VoltageReferences,Bandgap Reference.

UNIT-III:

CMOS Amplifiers: Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers,HighGain Amplifiers Architectures.

UNIT-IV:

CMOSOperationalAmplifiers: DesignofCMOSOpAmps,CompensationofOpAmps,DesignofTwo-StageOp Amps, Power- Supply Rejection Ratio of Two-Stage Op Amps, Cascode Op Amps, Measurement Techniques ofOPAmp.

UNIT-V:

Comparators: CharacterizationofComparator,Two-Stage,Open-LoopComparators,OtherOpen-LoopComparators,ImprovingthePerformanceof Open-LoopComparators, Discrete-TimeComparators.

UNIT-VI:

Oscillators&Phase-LockedLoops: GeneralConsiderations,RingOscillators,LCOscillators,VoltageControlledOscillators. SimplePLL,ChargePumpPLLs,Non-IdealEffectsinPLLs,DelayLocked Loops,Applications.

TextBooks:

1. DesignofAnalogCMOSIntegratedCircuits-BehzadRazavi,TMHEdition.
2. CMOSAnalogCircuitDesign-PhilipE.AllenandDouglasR.Holberg,OxfordUniversityPress,InternationalSecond Edition/Indian Edition, 2010.

References:

1. AnalysisandDesignofAnalogIntegratedCircuits-PaulR.Gray,PaulJ.Hurst,S.LewisandR.G.Meyer,WileyIndia, Fifth Edition, 2010.
2. Analog IntegratedCircuitDesign- DavidA.Johns,KenMartin,WileyStudentEdn,2013.

OUTCOMES

After goingthroughthiscoursethestudentwillbe ableto

- UnderstandtheconceptsofMOSDevicesandModeling.
- Design andanalyzeanyAnalogCircuitsinrealtimeapplications.
- ExtendtheAnalogCircuitDesigntoDifferentApplicationsinRealTime.
- UnderstandofOpen-LoopComparatorsandDifferentTypesofOscillators.

NETWORKSECURITYANDCRYPTOGRAPHY
ELECTIVE-II

OBJECTIVES:

- Inthis coursethefollowingprinciplesand practiceofcryptographyand networksecurityarecovered:
- Classicalsystems,symmetricblockciphers(DES, AES,othercontemporarysymmetricciphers)
- Public-keycryptography(RSA,discretelogarithms),
- Algorithms for factoring and discrete logarithms, cryptographic protocols,hash functions, authentication, keymanagement,keyexchange, signatureschemes,
- Emailandwebsecurity, viruses,firewalls,digital rightmanagement,andothertopics.

UNIT-I:

BasicPrinciples

SecurityGoals,CryptographicAttacks,ServicesandMechanisms,MathematicsofCryptography.

UNIT-II:

SymmetricEncryption

MathematicsofSymmetricKeyCryptography,IntroductiontoModernSymmetricKeyCiphers,DataEncryptionStandard,Advanced Encryption Standard.

UNIT-III:

AsymmetricEncryption

MathematicsofAsymmetricKeyCryptography,Asymmetric KeyCryptography

UNIT-IV:

DataIntegrity,DigitalSignatureSchemes &KeyManagement

MessageIntegrityandMessageAuthentication,CryptographicHashFunctions,DigitalSignature,KeyManagement.

UNIT-V:

NetworkSecurity-I

Securityatapplicationlayer:PGPandS/MIME,SecurityattheTransportLayer:SSLandTLS

UNIT-VI:

NetworkSecurity-II

SecurityattheNetworkLayer: IPSec,SystemSecurity

TEXTBOOKS:

1. CryptographyandNetworkSecurity,BehrouzAForouzan,DebdeepMukhopadhyay, (3e)McGraw Hill.
2. CryptographyandNetworkSecurity,WilliamStallings,(6e)Pearson.
3. EverydayCryptography,KeithM.Martin,Oxford.

REFERENCEBOOKS:

1.NetworkSecurityandCryptography,BernardMeneges,Cengage Learning.

OUTCOMES:

- Tobefamiliaritywith information securityawareness and aclearunderstandingofitsimportance.
- Tomasterfundamentalsofsecret andpubliccryptography
- Tomasterprotocols forsecurityservices
- Tobefamiliarwithnetworksecuritythreatsand countermeasures
- Tobefamiliarwithnetwork securitydesigns usingavailablesecuresolutions (suchasPGP,
- SSL, IPSec,etc)

IVYear-ISemester

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MICROWAVEENGINEERING&OPTICALLAB

Minimum Twelve Experiments to be conducted:Part–A(Any7Experiments(8&9compulsory)):

1. ReflexKlystronCharacteristics.
2. GunnDiodeCharacteristics.
3. AttenuationMeasurement.
4. DirectionalCouplerCharacteristics.
5. Impedanceand FrequencyMeasurement.
6. Scatteringparameters ofCirculator.
7. Scatteringparameters ofMagicTee.
8. RadiationPatternofHornandParabolic Antennas.
9. SynthesisofMicrostipantennas(RectangularStructure)UsingHFSS.

Part–B(Any5Experiments):

10. CharacterizationofLED.
11. CharacterizationofLaserDiode.
12. IntensitymodulationofLaseroutputthroughanopticalfiber.
13. MeasurementofData ratefor DigitalOpticallink.
14. MeasurementofNA.
15. MeasurementoflossesforAnalogOpticallink.

EquipmentrequiredforLaboratories:

1. RegulatedKlystronPowerSupply,Klystronmount
2. VSWRMeter
3. MicroAmmeter
4. Multimeter
5. CRO
6. GUNNPowerSupply,PinModulator
7. CrystalDiodedetector
8. Microwavecomponents(Attenuation)
9. FrequencyMeter
10. Slottedlinecarriage
11. Probedetector
12. Waveguideshorts
13. SSTuner
14. DirectionalCoupler
15. E,H,MagicTees
16. Circulators,Isolator
17. MatchedLoads
18. PyramidalHornand ParabolicAntennas
19. TurntableforAntennaMeasurements
20. HFSSSoftware
21. FiberOpticAnalogTrainerbased LED
22. FiberOptic AnalogTrainerbasedlaser
23. FiberOpticDigitalTrainer
24. Fibercables-(Plastic,Glass)

IVYear-ISemester

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DIGITALSIGNALPROCESSING LABORATORY

ListoftheExperiments /programs

ToStudenthastoperformatleastFOURExperimentsineachpart

PART-1(SIGNALS)

1) Generationofdiscretetimesignalsfordiscretesignals
2) To verifytheLinearConvolution
   a) UsingMATLAB
   b) UsingCodeComposerStudio(CCS)
3) ToverifytheCircularConvolution fordiscretesignals
   a) UsingMATLAB
   b) UsingCodeComposerStudio(CCS)
4) ToFindtheadditionofSinusoidalSignals
5) ToverifyDiscreteFourierTransform(DFT)andInverseDiscreteFourierTransform(IDFT)
   a) UsingMATLAB
   b) UsingCodeComposerStudio(CCS)
6) TransferFunctionStabilityAnalysis: usingpole-zeroplot,bodeplot,Nyquistplot,z-planeplot.

PART-2(FILTERS)

7) FrequencyResponseofIIRlowpass ButterworthFilter
8) FrequencyResponseofIIRhighpass ButterworthFilter
9) FrequencyResponseof IIRlowpass ChebyshevFilter
10) FrequencyResponseofIIRhighpassChebyshevFilter
11) FrequencyResponseofFIRlowpassFilterusingRectangleWindow
12) FrequencyResponseofFIRlowpassFilterusingTriangleWindow

PART–3(IMAGEPROCESSING)

13) Animageprocessingina falsecontouringsystem
14) Togeneratethehistogramequalizationtotheimage
15) ToverifytheNormalizedCrossCorrelationtotheadditionofnoiseandremovalofnoiseusingfilterstoanimage.
16) Computetheedgeofan imageusingspatialfilters.
17) Performtheimagemotionblurandcalculate PSNRtothenoiseimage andalsonoisefreeimage.
18) Toverifythe PSNRtothe Secondorder Decompositionof Discrete Wavelettransformsandtothereconstructedimageusing inverseDiscreteWavelet transform