PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

NAACAccredited-2015
'B'Grade(CGPA2.62)

Name of the Faculty: Science & Technology

Choice Based Credit System

Syllabus:Electronic Science

Name of the Course:M.Sc.- II (Semester III& IV)

(Syllabus to be Implemented from w.e.f. June 2021)

SCHOOL OF PHYSICAL SCIENCESPUNYASHLOKAHILYADEVIHOLKARSOLAPURUNIVERSITY

M.Sc. - Electronic ScienceChoiceBasedCreditSystem

w.e.f June2020-21

Semester	Code	Titleof thePaper	Semesterexam			L	T	P	Credits
First		**Hardcore**	**Theory**	**IA**	**Total**				
ES	**HCT1.1**	ElectronicsSystemdesign	80	20	100	4	1	-	4
	HCT1.2	NetworkAnalysisand Synthesis	80	20	100	4		-	4
	HCT1.3	SignalsandSystems	80	20	100	4		-	4
		SoftCore(Anyone)							
	SCT1.1	Microcontrollersand Interfacing	80	20	100	4		0	4
	SCT1.2	DigitalElectronicsand VerilogHDL	80	20	100	4		0	
									1
		Practical							
	HCT 1.1	PracticalHCP1.1	40	10	50	-	-	2	6
	HCP1.2	PracticalHCP1.2	40	10	50	-	-	2	
	HCP1.3	PracticalHCP1.3	40	10	50	-	-	2	
		Softcore(Anyone)							
	SCP1.1	PracticalSCP1.1	40	10	50	-	-	2	2
	SCP1.2	PracticalSCP1.2	40	10	50	-	-	2	
		Totalforfirstsemester	**480**	**120**	**600**				**25**
Second		**Hardcore**							
ES	**HCT2.1**	ControlSystems	80	20	100	4	1	-	4
	HCT2.2	DigitalSignalProcessing	80	20	100	4		-	4
		Softcore(Anyone)							
	SCT2.1	Advanced Microcontrollers andProtocols	80	20	100	4		-	4

	SCT2.2	VLSIDesign	80	20	100	4		-	
		Openelective(Anyone)							
	OET2.1	Fundamentalsof Electronics	80	20	100	4		-	4
	OET2.2	PowerSupplies	80	20	100	4		-	
									1
		Practical							
	HCP 2.1	PracticalHCP2.1	40	10	50	-	-	2	4
	HCP2.2	PracticalHCP2.2	40	10	50	-	-	2	
		Softcore(Anyone)							
	SCP1.1	PracticalSCP2.1	40	10	50	-	-	2	
	SCP1.2	PracticalSCP2.2	40	10	50	-	-	2	2
		Openelective(Anyone)							
	OEP2.1	PracticalOEP2.1	40	10	50	-	-	2	2
	OEP2.2	PracticalOEP2.2	40	10	50	-	-	2	
		Totalforsecond semester	**480**	**120**	**600**				**25**

Third		**Hardcore**							
ES	**HCT3.1**	**ProcessControl**	80	20	**100**	**4**		**-**	**4**
	HCT3.2	**Microwave Devices andApplications**	80	20	**100**	**4**		**-**	**4**
		Softcore(Anyone)	80	20					
	SCT3.1	**EmbeddedSystemDesign**	80	20	**100**	**4**		**-**	**4**
	SCT3.2	**Introduction to ElectronicsMaterials**	80	20	**100**	**4**	**1**	**-**	
		Openelective(Anyone)	80	20					
	OET3.1	**Antenna and WavePropogation**	80	20	**100**	**4**		**-**	**4**
	OET3.2	**Digital Electronics andCommunicationSystem**	80	20	**100**	**4**		**-**	
									1
		Practical							
	HCP	**PracticalHCP3.1**	40	10	**50**	**-**	**-**	**2**	**2**

	3.1								
	HCP3.2	**PracticalHCP3.2**	40	10	**50**	**-**	**-**	**2**	**2**
	SCP3.1	**PracticalSCP3.1**	40	10	**50**	**-**	**-**	**2**	**2**
		Openelective(Anyone)	40	10	**50**				
	OEP3.1	**PracticalOEP3.1**	40	10	**50**	**-**	**-**	**2**	**2**
	OEP3.2	**PracticalOEP3.2**	40	10	**50**	**-**	**-**	**2**	
		Totalforthirdsemester	**480**	**120**	**600**				**25**
Four		**Hardcore**							
ES	**HCT4.1**	**OpticalFiberCommunication**	80	20	**100**	**4**		**-**	**4**
	HCT4.2	**PowerElectronics**	80	20	**100**	**4**		**-**	**4**
	HCT 4.3	**PLCand SCADA**	80	20	**100**	**4**		**-**	**4**
			80	20			**1**		**1**
		Softcore(Anyone)	80	20					
	SCT4.1	**InternetofThings(IoT)**	80	20	**100**	**4**		**-**	**4**
	SCT4.2	**Foundation of Nano-electronics**	80	20	**100**	**4**		**-**	
	MP4.3	**MajorProject/ Internship**	**160**	**40**	**200**	**-**	**-**	**-**	**8**
		Totalforfoursemester	**480**	**120**	**600**				**25**
	Total								**100**

L=LectureT=TutorialsP=Practical4 Credits of Theory = 4 Hours of teaching per week 2 Credit of Practical = 4 hours per weekHCT = Hard core theorySCT = SoftcoretheoryHCP = Hard core practicalSCP = Soft core practicalOET=OpenelectivetheoryOEP = Open elective practicalMP = Major project

MP = Major project

- **160 Marks-University Examinations (Viva Dissertation, Project Progress, evaluation)**
- **40 Marks- Internal Performance Evaluation (15 Marks: Presentations, 15 Marks :Performance & 10 Marks: Attendance)**

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Class : M. Sc.-II, Semester :III

Subject : Electronics Science

HCT3.1:ProcessControl

UnitI **[12L +3T]**

ProcessDynamics:Dynamicelementsinacontrolloop,Deadtimeprocessesandsmithpredictorcompensator.Inverseresponsebehaviorofprocessesandcompensator.Dynamicbehavioroffirstand second ordersystems.Interactingandnon-interactingsystems.

ProcessControlAction: Elementsofprocesscontrol,ControllerPrinciple,ProcessCharacteristics, Control system parameters, discontinuous, continuous and composite controllermodes/actions(P,I,D,PI,PD and PID).

UnitII **[12L +3T]**

Process Controllers and Tuning: General features, construction and working of Pneumatic,Hydraulic andElectronic controller.Processreactioncurve method,Zigler-Nicholsmethod,Cohencooncorrectionfor quarter amplitude,Frequencyresponsemethod,Relaybased tuning.

Control Schemes: Feedback, feedforward, cascade, ratio, split range, selective control, adaptivecontrol,andmodel-basedcontrol.

UnitIII **[12L +3T]**

Analysis of Control Loop: Steady state gain, Process gain, Valve gain, Process time constant,Variable time Constant, Transmitter gain, Linearizing equal percentage valve, Variable pressuredrop. Analysis of Flow Control, Pressure Control, Liquid level Control, Temperature control,SLPC-features, faceplate, functions, MLPC- features, faceplate, functions, SLPC and MLPCcomparison.

Scaling:typesofscaling, examplesofscaling.

Nonlinear Systems: Nonlinear Elements in Loop: Limiters, Dead Zones, Backlash, Dead BandVelocity Limiting, Negative Resistance, Improvement in nonlinear process performance through:Deterministic Control Loop Calculations, Calculations of the measured variable, final controlelementselection, cascadecontrol design,Real time implementation issues.

UnitIV **[12L +3T]**

Multivariable Control: Block diagram analysis of multivariable systems, Interaction, Tuning ofMultivariablecontrollers,relativegainanalysis, Decouplerdesign.

IntelligentControllers:

Step analysis method for finding first, second and multiple time constants and dead time. ModelBased controllers: Internal Model control, Smith predictor, optimal controller, Model Predictivecontroller, Dynamic matrix controller (DMC). Self Tuning Controller. Fuzzy logic systems

andFuzzycontrollers,Introduction,BasicConceptsofFuzzyLogic,FuzzySets,FuzzyRelation,

FuzzyGraphs,andFuzzyArithmetic,FuzzyIf-ThenRules,FuzzyLogicApplications,Neuro-FuzzyArtificial Neural networks andANN controller,

TestBooks:

1. DonaldEckman,"AutomaticProcessControl",WileyEastern Limited, 1st Edition,1966
2. ThomasEMarlin,"ProcessControl-DesigningprocessesandControlSystemsforDynamicPerformance",McGraw-HillInternational Editions,1st Edition ,1995.
3. F.G.Shinskey,"ProcesscontrolSystems",TATAMCGRAWHILL,3rd Edition,1988.
4. KrishnaKant,"ComputerBasedIndustrialControl",PrenticehallofIndia,2nd Edition,2010.
5. BLiptek,"Instrumentengineershandbook",ChiltonbookCo,1st Edition,1969.
6. P.W.Murrill,"FundamentalsofProcessControl",InternationalSocietyofAutomation,1st Edition, 2000.
7. StephanopoulosGeorge,"ChemicalProcessControl",PrenticehallofIndia,UnitedStatesEdition, 1983.
8. P.W.Murrill,"Applicationsconceptsof Processcontrol",InternationalSocietyofAutomation,3rdedition, 2012.
9. B.Waynebequette,"Process Control:Modeling, Designand Simulation", Prentice hallofindia,1st Edition,2002.

ReferenceBooks:

1. Considine, "Process/Industrial Instruments and Controls Handbook", McGraw-HillProfessional,5th Edition,1999.
2. T.J.Ross,FuzzyLogic with EngineeringApplications, Wiley,3rd Edition,2011.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Class : M. Sc.-II, Semester :III

Subject : Electronics Science

HCT3.2:MicrowaveDevices&Applications

Unit-1 **[12L+3T]**

MicrowaveSolidStateDevices: MicrowaveTransistor:

Tunnel diode and its applications. TEDs: Introduction, Gunn Diode-Principle, RWH Theory,Characteristics,BasicModesOfOperation.AvalancheTransitTimeDevices:Introduction,IMPATTandTRAPATTDiodes–PrincipleofOperationandCharacteristics,ParametricAmplifiers.

UNIT2:MicrowaveBipolarTransistors,HeterojunctionBipolarTransistorsandTunneldiode **[12L +3T]**

PhysicalStructures,Configurations,Principlesofoperationandapplicationsof:

Microwave Bipolar Transistors,Heterojunction Bipolar Transistors, Microwave tunnel diodes,MicrowaveFieldeffectTransistors,JunctionField-EffectTransistors(JFETs),Metal-SemiconductorField-EffectTransistors(MESFETs),HighElectronMobilityTransistors(HEMTs),Metal Oxide-Semiconductor Field-EffectTransistors (MOSFETs).

Unit-3 **[12L +3T]**

TransferredElectronDevices(TEDs):

Introduction,Characteristic,featuresofmicrowaves,Limitationofconventionalsolidstatedevicesat Microwavefrequency.

Gunn – effect diodes – Gunn effect, Ridley – Watkins-Hilsum theory, Modes of operation,Limitedspace–Charge accumulation(LSA)mode of Gunn diode (INPandCdTe diode).Microwave generation and amplification. Structure, Operation, Power output and efficiency ofIMPATT and TRAPATTdiodes.

Unit–4 **[12L +3T]**

MicrowaveTubesandCircuits:

Microwave Tubes and Circuits: Klystrons: Reentrant Cavities, Velocity Modulation, BunchingProcess, Output Power & Beam Loading. Multicavity Klystron Amplifiers: Output Current andOutput Power Of Two – Cavity Klystron, Output Power Of four –Cavity Klystron. HELIXTWTS: Slow-Wave Structures, Amplification Process, Convection Current, Axial Electric Field,WaveModes, Gain Consideration.

MagnetronOscillators–CylindricalMagnetron,LinearMagnetron,CoaxialMagnetron,Voltage-TunableMagnetron,InvertedCoaxialMagnetron,Frequency-AgileCoaxialMagnetron

References:

1. LiaoSamuelY, *MicrowaveDevicesandCircuits*,Prentice-HallofIndiaPrivateLimited,NewDelhi2001
2. PozarDavid M., *MicrowaveEngineering*, JohnWileyand Sons,Inc.NewYork1999.
3. MicrowaveDevicesandCircuits,SamuelY.Liao,PHI,3rdEdition.
4. MicrowaveEngineering,DavidM.Pozar,WileyIndia,3rdEdition.
5. MicrowavePrinciples-HerbertJ.Reich,J.G.Skalnik,P.F.OrdungandH.L.Krauss,CBSPublishersandDistributors, NewDelhi, 2004.
6. MicrowaveEngineeringPassiveCircuits-PeterA.Rizzi,PHI,1999.

7. ElectronicandRadioEngineering-F.ETerman,McGraw-Hill,4thed.,1955

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Class : M. Sc.-II, Semester :III

Subject : Electronics Science

SCT3.1:EmbeddedSystemDesign

Unit1:EmbeddedsystemIntroduction [12L + 3T]IntroductiontoEmbeddedSystem,recenttrendsinembeddedsystems,embeddeddesignconceptsand definitions,memorymanagement,hardwareandsoftwaredesign andtesting.

System Architecture: Introduction to ARM core architecture, LPC 2148, ARM extension family,instruction set, thumb instruction set, Pipeline, memory management, Bus architecture, study ofon-chipperipheralslikeI/Oports,timers,counters,interrupts,on-chipADC,DAC,RTCmodules,WDT, PLL, PWM, USBetc.

Unit2:Communicationprotocols [12L + 3T]

SPI,SCI,SSP, I2C,CAN,USBetc.

Interfacing and Programming : Basic embedded C programs for on-chip peripherals studied insystem architecture. Need of interfacing, interfacing techniques, interfacing of different displaysandI/O devices.

Unit3:RealTimeOperatingSystemConcept [12L + 3T]Architectureofkernel,taskscheduler,ISR,Semaphores,mailbox,messagequeues,pipes,events,timers,memorymanagement,RTOSservicesincontrastwithtraditionalOS.Introductionto µcos .

Unit4:CaseStudies [12L + 3T]

RTOS for control systems, Case study of embedded system like digital camera, Mobile phones,Mobile Internet Device(MTD)

Textbooks:

1. Embeddedsystems: acontemporarydesign tool,James K. Peckol-WileyIndia
2. Embeddedsystems softwareprimer-David Simon– Pearson
3. ARMSystem-on-ChipArchitecture-SteveFurber-Pearson
4. JeanJ Labrose-MicroC/OS-II,IndianLowPriceEdition.

ReferenceBooks:

1. DR.K.V.K.K.Prasad- Embedded/realtimesystem –Dreamtech
2. Iyer,Gupta-EmbeddedrealsystemsProgramming-TMH
3. SteveHeath -Embedded SystemDesign-Neuwans
4. Frank Vahid-EmbeddedSystems-WileyIndia
5. EmbeddedSystems,Rajkamal -TMH.
6. ARMSystemDeveloper'sGuide,DesigningandOptimizingSystemSoftware-AndrewN.Sloss, DominicSymes,ChrisWright-Morgan KaufmannPublisher.
7. DatasheetofLPC2148.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Class : M. Sc.-II, Semester :III

Subject : Electronics Science

SCT3.2:IntroductiontoElectronicsMaterials

UnitI

Fundamentals of materials science – Relative stability of Phases,Phaserule,Phase Diagram,PhaseTransformations:ElementaryideaofNucleationandGrowth,methodsofcrystalgrowth.Defectsin crystals : Elementaryideaof point, lineand planar defects.
Materialsinthinfilmform:Conceptofthinfilms,preparationofthinfilms.

UnitII.

SpecialmaterialsinElectronics:
Compositematerials:Compositesofglasses,polymersmetalsandceramics,propertiesandapplications.
Polymers:Mechanismofpolymerination,conductingpolymers,applicationofpolymersinelectronics.
MetallicMaterials:Functionalgradientmaterials,shapememoryalloys,amorphousmaterials,ICpackagematerials.
Liquidcrystalpolymers:Opticalpropertiesofcholestericand chiralnematicsliquidcrystaldisplays,optical fibrematerials.

UnitIII

Introduction,Energybandsinsolids,SemiconductorsbandgapformationExtrinsicsemiconductors,Fermi levelvariations, andconductivity.
IntroductiontopnjunctionsandMetal-semiconductorjunctions.
pn junctions under bias, Junction breakdown, and Heterojunctions. Problem set onIntrisic,extrinsicand pn junction.

UnitIV

Conceptoforganicsemiconductors;
Chargecarriertransportinpolymeric andorganic semiconductors;Opticalproperties of organic semiconductors;
Chargeinjectionfrom metalstoorganic solids;
Operatingmodeofthemainplasticelectronicdevices: Organiclight-emittingdiodes(OLEDs),organicphotovoltaic cells (OPVs)and organic field-effecttransistors (OFETs).
InterfacesinplasticelectronicdevicesT

EXTBOOKS:

- PallabBhattacharya“SemiconductorOptoElectronicDevices”,PrenticeHallofIndiaPvt., Ltd., New Delhi, 2006.
- Jasprit Singh, “Opto Electronics – As Introduction to Materials and Devices”, Mc Graw-HillInternational Edition, 1998
- BenStreetman&SanjayBanerjeeSolidStateElectronicDevices,
- Murthy&Jena:Structureandproperties ofEngineeringMaterials ,TMHNew Delhi

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Class : M. Sc.-II, Semester :III

Subject : Electronics Science

OET3.1:Antennas&Wavepropagation

UNIT1: ANTENNABASICS: [12L+3T]

Introduction,RadiationMechanism,AntennaParameters-RadiationPatterns,PatternsinPrinciple Planes, Main Lobe and Side Lobes, Beam widths, Beam Area, Radiation Intensity,Beam Efficiency, Directivity, Gain and Resolution, Antenna Apertures, Aperture Efficiency,Effective Height, Antenna Theorems- Applicability and Proofs for equivalence of directionalcharacteristics.

Radiation from Wires: Retarded Potentials, Small Electric Dipole, Quarter wave Monopole andHalfwaveDipole Radiation characteristics

UNIT2:WAVE PROPAGATION [12L +3T]

ConceptsofPropagation-frequencyrangesandtypesofpropagations.GroundWavepropagation - characteristics, Parameters, Wave Tilt, Flat and Spherical Earth Considerations,Sky Wave Propagation-Formation of Ionospheric Layers and their characteristics, Mechanism ofReflection and Refraction, Critical Frequency, MUF & Skip Distance Calculations for flat andsphericalearthcases,OptimumFrequency,VirtualHeight,IonosphericAbnormalities,Ionospheric Absorption, Fundamental Equation for Free-Space Propagation, Basic TransmissionLossCalculations,SpaceWavePropagation-Mechanism,LOSandRadioHorizon,TroposphericWavePropagation-RadiusofCurvatureofpath,EffectiveEarth'sRadius,EffectofEarth'sCurvature,FieldStrengthCalculations,M-CurvesandDuctPropagation,TroposphericScattering.

UNIT3:ANTENNAARRAYS,HF,VHFANDUHFANTENNAS [12L +3T]

Two element array, Principle of Pattern Multiplication, N element Uniform Linear Arrays-Broadside, End fire Arrays, EFA with Increased directivity, Binomial Arrays, Traveling waveradiators–basicconcepts,Longwireantennas-fieldstrengthcalculationsandpatterns,V-antennas, Rhombic Antennas and Design Relations, Small Loop antennas- Concept of shortmagneticdipole, HelicalAntennas,Yagi-UdaArrays,Logperiodicantennas.

UNIT4:MICROWAVEANTENNASANDANTENNAMEASUREMENTTHEORY [12L +3T]

ReflectorAntennas:FlatSheetandCornerReflectors,ParaboloidalReflectors,CassegrainFeeds.Slot antennas-Babinets principle, Microstrip antennas,Hornantennas,Lens antennas(Qualitativetreatmentonly)AntennaMeasurements-PatternsRequired,SetUp,DistanceCriterion,DirectivityandGain Measurements(Comparison, Absoluteand3AntennaMethods).

TEXTBOOKS:

1. G.S.NRaju,"AntennasandWavePropagation",1stEditionPearsonEducation,2004.

2. K.D.Prasad,SatyaPrakashan,“AntennasandWavePropagation”,TechPublications,3rd

Edition, 2001.

REFERENCES:

1. C.A. Balanis, “AntennaTheory”, 3rdEdition, JohnWiley&Sons, 2012.
2. E.C.JordanandK.G.Balmain,“ElectromagneticWavesandRadiatingSystems”,PHI,2ndedition, 2000.
3. JohnD.KrausandRonaldJ.Marhefka,“AntennasandWavepropagation”,TMH,4rdEdition, 2010.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Class : M. Sc.-II, Semester :III

Subject : Electronics Science

OET-3.2:DigitalElectronics&CommunicationSystems

UNIT1 **[12L+3T]**

Introduction to communication, need for modulation, modulation and demodulation techniquesAM, FM and PM (Qualitative Analysis only), Block diagram of AM and FM transmitter andReceiver (Qualitative analysis) Sampling theorem, channel capacity, PAM, PPM, PWM andPCM,Digital modulationtechnique ASK,PSK, QPSK(Qualitative Analysisonly).

UNIT2 **[12L +3T]**

Introductory Aspects of Multiplexing and Multiple Accesses: FDM, TDM, FDMA, TDMA,CDMAand OFMDA.

Satellite Communication: Introduction, to Orbit, types of orbits, Block diagram of satellitetransponder.

UNIT3 **[12L +3T]**

EvaluationofCommunication:1stgeneration,2ndgeneration,3rdgeneration&4thgenerationmobile communication,Basicsofcellularcommunication(GSM,CDMA)-Cellarchitecture,Basestations,relaystationsandprinciplesofcommunication,IntroductiontoBluetooth,Wi-Fi, Wi-Maxand LTE network.

UNIT4. **[12L +3T]**

Binary Systems: Introduction to Digital Systems, Number systems, binary number system,Decimalto binary&binaryto decimal conversion,representation of binaryusinghexadecimal.

BooleanAlgebraandLogicGates: Basicdefinitions,operatorsofBooleanalgebra,basictheorems and properties of Boolean algebra, basic gates -AND, OR, NOT, XOR, NAND, NOR -onlytruth table &gaterepresentation,Boolean functions,canonical orstandard forms,

REFERENCE:

1. FloydTL"DigitalFundamentals", 7thEdition.(PearsonEducationAsia), 2002
2. M.MorrisMono,DigitalLogic andComputerDesign,4thEdition,Pearson,2009
3. SimonHaykins,AnIntroductiontoAnalogandDigitalCommunication,WileyStudentEdition, 2008.
4. B.P.Lathi,Moderndigitalandanalog Communicationsystems,3rdEdition2005OxfordUniversitypress.
5. HaroldP.E,SternSamyand AMahmond,CommunicationSystems,PearsonEdition, 2004.
6.DennisRoodyand John Coolen,ElectronicCommunication,4th Edition,2008.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Class : M. Sc.-II, Semester :IV

Subject : Electronics Science

HCT4.1OpticalFiberCommunication

Totalhours:60
Credits:4

Unit1.IntroductionandTransmissioncharacteristicsof opticalfibers:[12L+3T]

Thegeneralopticalcommunicationsystem,Advantagesanddisadvantages,Raytheoryoftransmission, Modetheory,Types ofoptical Fibers

Transmissioncharacteristicsofopticalfibers:

Attenuation, Material absorption, losses in fibers, Linear and Nonlinear scattering losses, fiberbend loss, Mid-infrared and Far-Infrared transmission. Dispersion: Intermodal and Intramodaldispersion,Dispersion modified Single modefibers.

Unit2.Opticalfibersandcables,JointsandCouplers:[12L+3T]

Preparation of optical fibers, Liquid phase and vapor phase deposition techniques, Fluoride glassfibers. Cables: Fiber strength, durability and stability of fiber transmission characteristics, cabledesignOpticalFiberJointsandCouplers:Fibersalignmentandjointloss.Fibersplices,connectors, Fiber couplers

Unit3.OpticalsourcesandOpticaldetectors:

[12L+3T]

Optical sources: LASERS basic concept, optical emission from semiconductors.SemiconductorInjectionLaser,Injectionlaserstructuresandcharacteristics,Laserfibercoupling,Non-semiconductor Lasers,Laser Modulation.LED) LED power and efficiency, LED structures,characteristicand Modulation techniques

Optical detectors: Introduction, device, types, optical detection principals, absorption, quantumefficiency Responsivity, Long wavelength Cutoff. Semiconductor photo diodes with and withoutinternal gain. Mid-infrared and photoconductive detectors, PN, PIN, Avalanche Photo diodes,Phototransistors.

Unit 4: Optical fiber Measurements, Receiver performance considerations andApplications:

[12L+3T]

Optical fiber Measurements: Attenuation, Dispersion, Refractive index profile, cutoffwavelength,Numerical aperture, fiberdiameter and fieldmeasurements.

Receiverperformanceconsiderations:Noise,Receivernoise,Receiverstructures,FETpreamplifiers,High performanceamplifiers.

Applications:PublicNetwork,Military,Civil,Consumer, IndustrialandComputerapplications.

Reference:

1. Opticalfiber communications–principlesandpractice.John.M. Senior

2 .Opticalcommunications ByDavid Gover

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Class : M. Sc.-II, Semester :IV

Subject : Electronics Science

HCT4.2:PowerElectronics

UNIT1:
Forcedcommunication,ThyristorprotectionandThyristorchoppersckts. [12L +3T]Forced communication:SCRswith DCsupply,forced commutations;class A, B, C, D, EandFcircuitsandanalysis

Thyristorprotection: Overvoltageandovercurrentprotections,dv/dtanddi/dtprotections,designof snubber circuits, RFIprotection,gateresistance

Thyristorchopperscircuits
Principlesofstep-downandstep-upchopperswithRandR-Lloads,impulsecommutatedchopper,impulsecommutated threethyristorchoppers, resonant pulsechoppers/supplies

UNIT2:
Switchedmodepowersupply [12L +3T]
SMPS,comparisonwithconventionalpower supply, buckregulator,boost regulator,Buck-Boostregulator,Cuk regulator

UNIT3:ControlledRectifiers [12L +3T]
SinglephasecircuitsHalfandFullcontrolledbridgerectifierwithresistiveRandR-Lloadwithandwithout freewheelingdiode, seriesanddualconverter, power factorimprovement.
Threephasecircuits:Halfwave-controlledrectifier,Halfcontrolledrectifier,Halfcontrolledbridge rectifier,FullycontrolledbridgerectifierwithR and R-Lload, threephasedual converter

UNIT4: A-Cpowercontrol [12L +3T]
A-COn/offandphasecontrols,uniandbidirectionalcontrollerswithRandR-Lloads,threephasehalfand full wavecontrollers with R and R-Lloads.

Text/ReferenceBooks:

1. PowerElectronics byM.H. Rashid,PHI
2. PowerElectronics–P.C.Sen
3. PowerElectronics– WilliamsELBS
4. SimplifieddesignoflinearPowersupplies:JohnD.Lenk,Butterworth-Heinemann
5. Simplifieddesignofswitchingpowersupplies:JohnD.Lenk,Butterworth-Heinemann
6. Regulatedpowersupplies IrvingMGottlieb,TABbooks
7. PracticalDesignofPowerSupplies:Ron Lenk, IEEEpress +McGrawhill
8. ElectricPowerTransformerEngineering:JamesH.Harlow,CRCPress

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Class : M. Sc.-II, Semester :IV
Subject : **Electronics Science**

HCT4.3:PLCand SCADA

UnitI: [12L +3T]

Introduction: Overview,OSI referencemodel,Transmissionmedia:Coppercable,Coaxial cables, Twisted-pair cable, Connector standards, Earthing/grounding, Fiber-opticcablecomponents, Fiber-opticcable parameters

Opencontrolnetwork:RS-232overview,RS-232interfacestandard,RS-232troubleshooting,TypicalRS-232problems,RS-485overview,TheRS-485interfacestandard, RS-485 troubleshooting Current loop and RS-485 converters overview, TCP/IPoverview, Internet layer protocols (packet transport), Modbus overview, Modbus protocolstructure,Modbus troubleshooting

UnitII: [12L +3T]

Networkatdifferentlevel:AS-I,CAN,Devicenet,IndustrialEthernetoverview,Profibus PA/DP/FMS overview, Foundation Fieldbus overview, The physical layer andwiring rules, HART overview, Introduction to HART and smart instrumentation. **SafetyInstrumented System (SIS)**: Need for safety instrumentation- risk and risk reductionmethods, hazards analysis. Process control systems and SIS. Safety Integrity Levels (SIL)andavailability.IntroductiontotheinternationalfunctionalsafetystandardIEC61508

UnitIII: [12L +3T]

Automation Fundamentals: Automation and its importance, automation applications,expectations of automation. Process and factory automation. Types of plant and control –categories in industry, open loop and close loop control functions, continuous processes,discrete processes, and mixed processes. Automation hierarchy – large control systemhierarchy, data quantity & quality and hierarchical control. Control system architecture –evolutionand current trends,comparison of different architectures.

Programmable Logic Controller Hardware: Evolution of PLC, Definition, functionsof PLC, Advantages, Architecture, working of PLC, Scan time, Types & Specifications.DIDO- AI-AOexamples and ratings,I/O modules,local and remoteI/Oexpansion,specialpurposemodules,wiringdiagramsofdifferentI/Omodules,communicationmodules, Memory & addressing- memory organization (system memory and applicationmemory),I/Oaddressing,hardwaretosoftwareinterface.SoftwareDevelopmentof

Relay Logic Ladder Diagram, introduction to PLC Programming, programming devices,IEC standard PLC programming languages, LD programming- basic LD instructions,PLCTimersandCounters:Typesandexamples,datatransfer&programcontrolinstructions,advancedPLCinstructions,PIDControlusingPLC.Casestudy:PLCselectionand configuration for anyoneprocess applications.

UnitIV: [12L +3T]

Distributed Control System (DCS): Introduction to DCS. Evolution of DCS, DCS flowsheet symbols, architecture of DCS. Controller, Input and output modules,Communicationmodule,datahighway,localI/Obus,Workstations,SpecificationsofDCS.IntroductionofHierarchicalcontrolofmemory:Tasklisting,HigherandLowercomputerleveltask.SupervisorycomputertasksDCSconfiguration.Supervisorycomputerfunctions,Controltechniques,SupervisoryControlAlgorithm.DCS&Supervisorycomputerdisplays,advancedcontrolStrategies,computerinterfacewithDCS.DCS. System integration with PLCscomputer:HMI,Manmachineinterfacesequencing,Supervisorycontrol,andintegration withPLC,personalcomputersanddirectI/O,seriallinkages,networklinkages, link between networks. Introduction to DCS Programming, Function BlockDiagrammethodfor DCS programming.

Supervisory Control and Data Acquisition (SCADA): SCADA introduction, briefhistory of SCADA, elements of SCADA. Features of SCADA , MTU- functions of MTU,RTU- Functions of RTU, Protocol Detail SCADA as a real time system CommunicationsinSCADA-types&methodsused,components,ProtocolstructureandMediumsusedforcommunicationsSCADADevelopmentforanyonetypicalapplicationProgrammingforGUIdevelopment usingSCADA software.

TextBooks:

1SamuelM.Herb,―UnderstandingDistributedProcessorSystemsforControl‖,InternationalSocietyofAutomation Publication,1st Edition, 1999.

2. ThomasHughes,―ProgrammableLogicController‖,InternationalSocietyofAutomationPublication,4th Edition, 2004

3. StuartA.Boyer,―SCADAsupervisorycontrol anddataacquisition‖,InternationalSocietyofAutomation Publication, 4th Edtion, 2009.

4. GruhnandCheddie,―SafetyShutdownSystems‖,InternationalSocietyofAutomation, 2nd Edition, 2006.

ReferenceBooks:

1. PoppovikBhatkar,―DistributedComputerControlinIndustrialAutomation‖,CRCpress,2ndeditio n, 1990.

2. S.K.Singh,―ComputerAidedProcessControl‖,PrenticeHallofIndia,1stEdition,2004.

3. KrishnaKant,―ComputerBasedProcessControl‖,PrenticeHallof India,2ndedition,2010.

4. N.E.Battikha,―TheManagementofControlSystem:JustificationandTechnicalAuditing‖,InternationalSocietyofAutomation, 1st Edition,1992.
5. GaryDunning,―IntroductiontoProgrammableLogiccontroller‖,ThomasLearning,Pckedition,2001.
6. John.W.Webb,RonaldAReis,―ProgrammableLogicControllers–PrinciplesandApplications‖,PrenticeHallInc, 5th Edition, 2002.
7. BelaG.Liptak,―Instrumentengineershandbook-Processcontrol‖,Chiltonbookcompany,3rdedition, 1969.
8. D.J.Smith,K.G.L.Simpson,―FunctionalSafety:AStraightforwardGuidetoIEC61508andRelated Standards‖,Butterworth-Heinemann Publications,2nd Edition, 2004.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Class : M. Sc.-II, Semester :IV
Subject : **Electronics Science**

SCT4.1:InternetofThings

UNIT1:Introductionto IoT [12L +3T]

IoT, origin of terminology, characteristics, market share, evolution of connected devices, modernday IoT applications, IoT enablers(supportive companies), connectivity layers, IoT vs. M2M,Technologyinterdependence.

UNIT2: Basics of IoTNetworking [12L +3T]

Sensing(need, definition, classification, applications), Actuation (need, definition, classification,applications),IoTcomponents,IoTcategories,Challenges,FundamentalsofIoTnetworking(MQTT, CoeP, SmQTT,XmPP), Connectivity technology(CSMA,WSN, bluetooth,Xbee,WiFi,LoWPANetc.), sensornetworkterminologyandfundamentals.

UNIT3:SensorNetworks [12L +3T]

Sensor networks, Sensor node, Applications of WSN, coverage, area coverage, Barrier coverage,UAV features, Key issues, UAV networks, machine to machine communication, interoperabilityof IoT.

UNIT4:Softwaredefinednetworking [12L +3T]

Introduction to software defined networks, software defined IoT networking, cloud computing,definition, fundamentals, service model, Service management, Service security, sensor
cloud,introductiontofogcomputing,smartcity,smarthomes,connectedvehicles,smartgrids,introductionto industrialIoT.

References:

1. SudipMishra,TranscriptsofIntroduction Internetofthings, IITKharagpur.
2. Rajkumarbuyya,Internet ofthings,Nov-2014.
3. Jaffrey, Internetofthings-IoTEuropeanresearchclusters,2013.
4. RonaldYYager,New advancesin InternetofThings,Springer2018.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

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SCT4.2Foundation ofNanoelectronics

UNIT1 **[12L +3T]**

Region of nanostructures, scaling of devices in silicon technology, estimation of technologylimits, Uncertainty principle, Experiments on duality, Schrodinger's equation and its applicationstosquarewellpotential,squarepotential barrier (1D).

UNIT2 **[12L +3T]**

Infinite array of potential wells, Barrier penetration, applications to tunnel diode, Josephsoneffect, Perturbation theory and its applications, Scattering. Binomial and related distributions,Phasespace,Statisticalensembles,applicationsofclassicalstatisticalmechanics,Quantumstatistics, Brownian motion, Random walk problem.Concept of Chemical potential, partitionfunctionand its applications incomputingthermodynamicquantities.

UNIT3 **[12L +3T]**

Quantum electronic devices, electrons in mesoscopic structures, short channel MOSFET, split-gate transistor, electron wave transistor, electron spin transistor, quantum cellular automata,Bioelectronics,molecularprocessor,DNAanalyzerasbiochip,Molecularelectronics,Fullerenes,nanotubes, switches based onFullerenes andnanotubes.

UNIT4 **[12L + 3T]**

Nanoelectronics with tunneling devices, resonant tunneling diode(RTD), three terminal RTDS,RTDbased memory, basiclogicgates anddynamiclogicgates,
Principleofsingleelectrontransistor,Coulombblockade.

Text/ReferenceBooks:

1.NanoelectronicsandNanosystems:K.Goser,P.Glosekotter,J.Dienstuhl,Springer (2005).2.QuantumMechanics: SchiffL.I. , “”
3.FundamentalsofStatisticalMechanicsandThermalPhysics:Reif