SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
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SCHOOL OF ELECTRICAL AND ELECTRONICS

Minutes of Board of Studies Meeting held on 28thNOVEMBER 2020

(Virtual Meeting conducted on Zoom Platform (Time: 10.30 a.m. to 12 noon)

- Dr.N.M.Nandhitha, Prof. & Dean School of Electrical and Electronics started the meeting by welcoming both the external and the internal numbers to the Board of Studies meeting (28.11.2020, 10.00 a.m. to 12.00 noon)

- Dr.T.Ravi, Head, Dept. of Electronics and Communication Engineering informed the board that core competencies are identified from the feedback obtained from the students, faculty, Alumni and employers.

- Dr.P.Kavipriya proposed to remove the following topics in Electronic Circuits I (3rd Semester) course: 'Approximate Model- Analysis of CE, CC and CB amplifiers using Approximate model equivalent circuits to obtain gain, input impedance and output impedance'. Dr.M.D.Selvaraj, Associate Professor, IIITDM accepted the changes and suggested to include Frequency response of the Differential amplifier in unit V instead of power supply and amplifiers.

- Dr.S.Lakshmi suggested to introduce 'Antenna for 5G application and Software Tools for Antenna Design and Analysis' in the course Antenna and Wave Propagation. Dr.N.Sivakumaran, Prof.,NIT, Trichy accepted the inclusion and also suggested to introduce simulation through HFSS in the class.

- Dr.M.Sumathi suggested to include the topics Li-Fi in the course Optical Communications. Dr.N.Shivakumaran accepted and suggested to remove WDM, SONET/SDH, ATM,IP over WDM.

- Dr.Sugadev presented the syllabus revision for 'Embedded Processors'.Board accepted the change and Mr.J.Visweswaran suggested to include System on Chip concept in the syllabus.

- Syllabus revision proposed in 'High Performance Computing' by Dr.Dr.S.Poorna Pushpa Kala was accepted by Dr.M.D.Selvaraj.

- Dr.S.Barani suggested to remove 'Basics of Spark-Programming in Scala'for the course 'Real Time Data Analytics'. Mr.J.Visweswaran accepted the changes and

suggested to include function programming in Scala. Dr.N.Sivakumaran suggested to include Case studies on influx and Grafana.

- Having discussed the revisions in the existing courses, faculty then presented the syllabus for the new courses. Dr.P.Chitra presented the syllabus for Digital Image Processing for Real Time Applications and Deep Learning Neural Networks. Dr.M.D.Selvaraj accepted the syllabus for both the courses.

- Dr.M.Sugadev presented the syllabus for 5G communication. Dr.N.Sivakumaran suggested to include mmWave communication in the syllabus.

- Dr,S.Poornapushpakala presented the syllabus for Machine Learning using Python. Mr.Visweswaran suggested that Least Squares Optimization, Collaborative Filtering and related topics can be included.

- Dr.S.Barani presented the syllabus for IoT for Real time Applications. Dr.N.Sivakumaran accepted the syllabus and he suggested that students can be made to do miniprojects in this course.

- Dr.M.Sugadev presented the syllabus for Drone Electronics. Syllabus was accepted by the board and Dr.M.D.Selvaraj suggested that this course can be offered to all branches of Engineering.

- Dr.P.Kavipriya presented the syllabus for Industrial Internet of Things. Mr.Visweeswaran suggested that Middleware Software protocol can be included.

- Dr.S.lakshmi presented the syllabus for eHealth and Dr.N.Sivakumaran suggested that mobile application development for biomedical applications can be included as part of the syllabus.

- Dr.N.M.Nandhitha informed the Board that part of the syllabus in SEC1320 Embedded Systems will be delivered by the industry expert so as to make the students understand the applications of embedded systems in industries. Mr.J.Visweswaran appreciated the initiative and suggested that at least one course in each semester can be identified for partial delivery of syllabus by expert from industry.

Table 1. Revision Carried out in the courses

SL NO	COURSE CODE	COURSE NAME	DELETED TOPICS	ADDED TOPICS
1	SECA1307	ELECTRONIC CIRCUITS I	**UNIT 5** Linear mode power supply - Rectifiers - Half-Wave Rectifier - Full-Wave Rectifier - Filters-L,C, LC, CLC Filter- Regulators -Zener Diode regulator- Linear series, shunt voltage Regulators - Switched mode power supply (SMPS) – Large Signa Amplifiers – Class A, Class B, Class C, Class D- Distortion	**UNIT 5** Current sources for biasing – Current steering circuits – Current mirror with improved performance (Cascode mirror, Wilson, Widlar). Large and small signal operation of Differential pair circuit Differential pair with active load

			in power amplifiers	
2	SECA1505	ANTENNA AND WAVE PROGRAGATION	**UNIT 5** Anechoic Chamber-Radiation Pattern Measurement-Gain measurement-Beamwidth and Directivity Measurement-Impedance Measurement - Measurement of radiation efficiency- Ionospheric measurements - Vertical incidence measurements of the ionosphere - Relation between oblique and vertical incidence transmission - System Issues – antenna noise.	UNIT 5 Concepts and Benefits of Smart antennas - Fixed weight beamforming- Adaptive beamforming – Design of Planar array antennas for Beamforming applications – Feed techniques for Planar arrays - Role of Smart Antennas in Green Communications and 5G wireless communications – Software Tools for Antenna Design and Analysis
3	SEC1407	OPTICAL COMMUNICATIONS	**UNIT 5** Applications- Military	**UNIT 3** Vertical cavity surface emitting laser,Resonant cavity enhancement **UNIT 5** Optical OFDM, High-speed Light-Waveguides, Reconfigurable optical add/drop multiplexer, Light-Fidelity (Li-Fi) Technology-Introduction, working principle, Comparison of Li-Fi and Wi-Fi, Li-Fi networks, Applications.Case study: Evaluation of building a Fiber Optic network
4	SECA3019	EMBEDDED PROCESSORS	**UNIT 5** Introduction - fixed and floating point –Core architecture of ADSP218X-Arithmetic Logic Unit (ALU) – Multiplier and Accumulator (MAC) Unit- Barrel Shifter-Data Address Generator (DAG)- Program Sequencer-Functional Diagram of TMS320C54XX.	**UNIT 5** Introduction to ARM CORTEX series, improvement over classical series and advantages for embedded system design. CORTEX A, CORTEX M, CORTEX R processors series, versions, features and applications, need of operating system in developing complex applications in embedded system, Firmware development for ARM Cortex, Survey of CORTEX M3 based controllers, its features and comparison
5	SECA7020	HIGH PERFORMANCE COMPUTING	**UNIT 4** Intrusion Detection and Prevention, Intrusion Risks, Security Policy, Monitoring and Reporting of Traffics, Traffic Shaping, Investigating and Verifying Detected Intrusions	**UNIT 4** Scheduling Parallel Jobs on Clusters, Parallel Programming Models, Parallel and High Performance programming

			Reporting and Documenting Intrusions. **UNIT- 5** Define the Types of Intrusion Prevention Systems, Intrusion Prevention System Basics, and Limitations of Intrusion Prevention System, Spoof Prevention, Denial of Service (DoS), and Quality of Service (QoS) Policy, Web Application Firewall, Packet Signature and Analysis.	languages, Dependence Analysis of Data arrays **UNIT- 5** Quantum computing and its issues
6	SECA7023	REAL TIME DATA ANALYTICS	**UNIT 1** Basics of Spark-Programming in Scala	**UNIT 1** Expressions-Functions – Classes- File I/O – Exceptions – Combining UNIT-2 Distributed Storage-Parallelism, Regression. Classification and Clustering with Spark UNIT-4 Kafka Architecture and Components, Kafka Cluster, Kafka Producer, Kafka Consumer

- Dr.Lalithakumari.S, suggested few modifications in the course 'Industrial Unit Operations'. She proposed the inclusion of topics leaching and extraction. It has been accepted by Dr.Sivakumaran, and he suggested to include the same along with mixing and separation unit operations. Dr. D.Marshiana suggested that 'Humidification, de-humidification' can be added. Dr. Sivakumaran agreed for the inclusion.

- Dr.Lalithakumari presented the syllabus for an elective course 'Optimal Control Systems'. Dr.Sivakumaran accepted the syllabus change suggested that students may be asked to do mini projects in this course.

COURSE CODE	COURSE NAME	DELETED TOPICS	INCLUDED TOPICS
SEIA1402	Industrial Unit Operations	--	Unit-4 Humidification, De-humidification Unit-2 Leaching and extraction

- Dr.V.Sivachidambaranathan,Prof.&Head,Dept.ofElectricalandElectronicsEngineerin grequested the board to shift the course "Applied Thermodynamics" to elective. Dr.M.D.Selvaraj accepted the suggestions.

- Dr.A.Ramesh babu and Dr.S.D.Sundar Singh Jebaseelanputforth the syllabus of the new courses, 'Modern Power Converters'and'Distributed Generation and Microgridss'for the approval of the board. Dr N Sivakumaran approved the Syllabus for these new courses.

- BoS members are happy that the new and the revised courses enhance employability/ Entrepreneurship/Skills of the students.

EXTERNAL MEMBERS:

1. Dr.N.Sivakumaran
2. Dr.M.D.Selvaraj
3. Mr.J.Visweswaran

INTERNAL MEMBERS:

1. Dr.N.M.Nandhitha
2. Dr.T.Ravi
3. Dr.P.Chitra
4. Dr.S.Barani
5. Dr.S.Poornapushpakala.
6. Dr.M.Sumathi
7. Dr.S.Lakshmi
8. Dr.P.Kavipriya
9. Dr M Sugadev
10. Dr .E.Anna Devi
11. Ms.S.Yogalakshmi
12. Dr.LalithaKumari.S
13. Dr.Pandian.R
14. Dr.Marshiana.D
15. Dr.V.Sivachidambaranathan
16. Dr.D.Susitra
17. Dr.R.Vanitha
18. Mrs.D.Ramya
19. Mrs.P.Sivagami

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SYLLABUS REVISION

SL.NO	COURSE CODE	COURSENAME
1	SECA1307	ELECTRONIC CIRCUITS I
2	SECA1505	ANTENNA AND WAVEPROGRAGATION
3	SEC1407	OPTICALCOMMUNICATIONS
4	SECA3019	EMBEDDEDPROCESSORS

SECA1302	ELECTRONIC CIRCUITS - I	L	T	P	Credits	Total Marks
		3	*	0	3	1

PAPER PATTERN

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UNIT 5 POWER SUPPLIES AND POWER AMPLIFIERS 9 Hrs.
Linear mode power supply - Rectifiers - Half-Wave Rectifier - Full-Wave Rectifier - Filters-L,C, LC, CLC Filter- Regulators -Zener Diode regulator- Linear series, shunt voltage Regulators - Switched mode power supply (SMPS) – Large Signa Amplifiers – Class A, Class B, Class C, Class D- Distortion in power amplifiers.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Acquire knowledge of simple BJT circuits design and implement circuits with transistor biasing design.
CO2 - Draw the equivalent circuits of BJT and FET.
CO3 - Understand the working principles, Frequency response characteristics of BJT and FET.
CO4 - Compare the frequency response characteristics of BJT and FET amplifiers.
CO5 - Design and troubleshoot simple power supplies and Analyse the performance parameters of power supplies.
CO6 - Understand and identify the performance level in power amplifiers and checking its distortion levels.

1 Max. Marks:

20 Marks
80 Marks

PART A: 10 Questions of 2marks each-No choice
PART B: 2 Questions from each unit of internal choice; each carrying 16 marks

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SECA1307 (Revised)	ELECTRONICCIRCUITS-I	L	T	P	Credits	Totalmarks
		3	0	0	3	100

Prerequisite: ElectronDevices	**CoRequisite:**ElectronicCircuitsI Lab

CourseObjectives

- Tounderstandthemethodofbiasingtransistors.
- Toacquiretheknowledgeofequivalentcircuits.
- Tounderstandthefrequencyresponseofamplifiers.
- Toprovidefoundationandconfidencetothestudentstotroubleshootandfaultanalysisofpowersuppliesandpoweramplifiers.
- Todevelopcurrentmirrorsanddifferentialoperations.

UNIT	CONTENTS	HOURS
I	**BiasingofBJTandFET** BJT– Need for biasing – Various biasing methods of BJT- Bias Circuit Design- DCLoad Line – DC analysis of Transistor circuits- AC Load Line- AC analysis ofTransistor Circuits- Quiescent Point – Thermal stability - Stability factors - Biasing ofJFET- VariousbiasingmethodsofJFET-JFETBiasCircuitDesign-MOSFET Biasing-Twoportnetwork.	9
II	**EQUIVALENTMODELSOFBJTANDFETAMPLIFIERS** Hybrid model- Analysis of CE, CC and CB amplifiers using Hybrid equivalent circuitsto obtain gain, input impedance and output impedance--Small Signal Amplifiers –Analysis of CE, CC and CB amplifiers using small signal equivalent circuits to obtaingain, input impedance and output impedance. Small Signal equivalent circuit of FETand MOSFET - Analysis of CS, CD and CG JFET amplifiers using small signalequivalentcircuits-AnalysisofCS,CDandCGMOSFETamplifiersusingsmall signalequivalentcircuits	9
III	**MULTISTAGE AMPLIFIERS AND FREQUENCY RESPONSE OF BJT AND FETAMPLIFIERS** Multistage Amplifiers- Methods of Coupling- RC Coupled- Transformer Coupled –Direct Coupled Amplifiers- Amplifier frequency response – Miller effect- Frequencyresponse of transistor amplifiers with circuit capacitors – BJT frequency response – LowandHighfrequencyanalysisofCE,CB,CC-	9

	FrequencyresponseofFET -Low andHigh frequencyanalysisofCS,CG,CDJFET&MOSFET.	
IV	**POWERSUPPLIESANDPOWERAMPLIFIERS** Linear mode power supply - Rectifiers - Half-Wave Rectifier - Full-Wave Rectifier -Filters-L, C, LC, CLC Filter- Regulators - Zener Diode regulator- Linear series, shuntvoltageRegulators-Switched modepowersupply(SMPS) –Large SignalAmplifiers –ClassA,ClassB,ClassC,ClassD-Distortioninpoweramplifiers.	9

V	**CURRENTMIRRORSANDDIFFERENTIALAMPLIFIERS** Current sources for biasing – Current steering circuits – Current mirror with improvedperformance (Cascode mirror, Wilson, Widlar). Large and small signal operation ofDifferential pair circuit Differential pair with active load - Frequency response of theDifferentialamplifier	9

MaximumHours:45

CourseOutcomes

Oncompletionofthecourse,thestudentshouldbeablet

oCO1–DesignbiasingcircuitsforBJTandFET.

CO2–AnalyzeBJTandFETamplifiersusingequivalentcircuitmodels.

CO3–

EvaluatefrequencyresponseofBJTandFETamplifiersindifferentconfigurations.

CO4–DesignmultistageamplifiersusingBJT

CO5–

Analyzetheperformanceofpowersuppliesandpoweramplifiers.C

O6–Designcurrentmirrorsanddifferentialamplifiers

TEXT/REFERENCEBOOKS

1. MillmanJandHalkiasC.,“IntegratedElectronics”,TMH,2nd Edition,2017.
2. S.Salivahanan,N.SureshKumar andA.Vallavaraj,“ElectronicDevicesandCircuits”,TMH,2nd Edition,2017.
3. AdelS.SedraandKennethC.Smith,“MicroelectronicCircuits”,OxfordUniversityPress ,SixthEdition,2009.
4. BehzadRazavi,“FundamentalsofMicroelectronics”,1st edition,wileypublication,2008.
5. Donald.A.Neamen,“ElectronicCircuitsAnalysisandDesign”,McGrawHillEducation(I ndia)PrivateLtd.,3rd Edition,2010.
6. RobertL.BoylestadandLouisNasheresky,”ElectronicDevicesandCircuitTheory”,Pe arsonEducation,11th Edition,2013.
7. Floyd,“ElectronicDevices”,PearsonEducation,9th Edition,2012.

SECA1504	ANTENNAS AND WAVE PROPAGATION	L	T	P	Credits	TotaMarks
		3	*	0	3	1

COURSE OBJECTIVES

- To learn the basic antenna parameters.
- To understand the radiation mechanism from the dipole antennas.
- To explore the various antenna arrays and calculate the maxima, minima and half power directions.
- To discuss the characteristics of travelling wave radiators and high frequency antennas.
- To study antenna measurements techniques.

UNIT 1 ANTENNA FUNDAMENTALS AND WIRE ANTENNAS 9 Hrs.

Basic Antenna elements-properties of antenna-Isotropic radiator- Antenna parameters(definition only): Radiation Intensity,Radiation pattern, Gain and Directivity, FBR, Effective Length, Effective Aperture, Radiation Resistance, Antenna Terminal(self and mutual) Impedance, Polarization, Beam width, Bandwidth, Antenna temperature, Friis transmission formula. WireAntennas: Retarded Potentials, Short Electric Dipole, Radiation from an alternating current element, Half wave Dipole,quarter wave monopole - Fields, Power radiated and Radiation Resistance.

UNIT 2 ANTENNA ARRAYS 9 Hrs.

Types of arrays - Broad side, End fire, Collinear, Parasitic arrays.-Arrays of two point sources. N element of uniform lineararrays –Array of N elements with equal spacing and currents equal in magnitude and spacing (broad side array)- Array of Nelements with equal spacing and currents equal in magnitude but with progressive phase shift(end fire array)-Hansenwoodyard array -Pattern Multiplication - Binomial arrays.

UNIT 3 TRAVELLING WAVE AND BROADBAND ANTENNAS 9 Hrs.

Effect of ground on ungrounded antenna-Methods of excitation-Travelling wave radiators: basic concepts, Long wireantennas-field strength calculations and patterns- V-antennas, Rhombic Antennas, Small Loop antennas- Concept of shortmagnetic dipole, Helical Antennas, Folded Dipole Yagi-Uda Arrays, Log periodic antennas. Reflector Antennas: Huygens'principle-Flat Sheet and Corner Reflectors, Paraboloidal Reflectors, Cassegrain Feeds. Slot antennas-Babinets principle,Horn antennas, Lens antennas, Microstrip antennas.

UNIT 4 PROPOGATION 9 Hrs.

Factors involved in the propagation of Radio Waves- Ground wave propogation, Structure of Ionosphere and its effects onradio waves- Refraction and Reflection of sky wave by the ionosphere, Ray paths-Measures of Ionosphere propagation:critical frequency, skip distance, virtual height, Maximum usable frequency, Fading of signals: Selective fading – Diversityreception, Space wave propagation-Considerations in space wave propagation, Atmospheric effects in space wavepropagation, Super Refraction - Duct Wave Propagation.

UNIT 5 ANTENNA MEASUREMENT 9 Hrs.

Anechoic Chamber-Radiation Pattern Measurement-Gain measurement-Beamwidth and Directivity Measurement-Impedance Measurement - Measurement of radiation efficiency- Ionospheric measurements - Vertical incidence measurements of the ionosphere - Relation between oblique and

vertical incidence transmission - System Issues – antennanoise.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Define the antenna basic parameters.

CO2 - Explain the radiation mechanism from the dipole elements.

CO3 - Classify antenna arrays and infer their significance.

CO4 - Analyze the characteristics of low and high frequency antennas.

CO5 - Compare the properties and measures of various radio wave propagation.

CO6 - Perform antenna measurements and analyze the parameters and develop the basic skills for designing practicalantennas.

TEXT / REFERENCE BOOK

1. K.D.Prasad, “Antennas and Wave Propagation”, 3rd Edition, Satya Prakasan, New Delhi,2003.
2. R.L. Yadava, “Antennas and Wave Propagation”, 2nd Edition, PHI Learning Private Limited, New Delhi,2011.
3. Balanis, C.A., “Antenna Theory and Design”, 4th Edition, John Wiley and Sons, 2016.
4. Jordan, E.C. and Balmain, K.G., “Electromagnetic Waves and Radiating Systems”, 2nd Edition, Prentice Hall of India,2006.
5. Collin, R.E., “Antennas and Radio Wave Propagation”, McGraw Hill, 1985.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 Exam Duration: 3 Hrs.

PART A: 10 Questions of 2 marks each – No choice 20 Marks

PART B: 2 Questions from each unit of internal choice; each carrying 16 marks 80 Marks

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SECA1505 (revised)	ANTENNAANDWAVEPROPAGATION	L	T	P	Credits	Total marks
		2	0	2	3	100

Prerequisite: ElectromagneticTheory | **CoRequisite:** NIL

CourseObjectives

- Tounderstandtheradiationmechanismofdifferentantennas,theirparametersanddesign aspects.
- Tolearnaboutantennaarraysandtheirradiationpattern.
- Tolearnabouttravellingwaveandbroadbandantennas.
- Tounderstandelectromagneticwavepropagationovergroundandthroughdifferentlaye rsofatmosphere.
- TolearnaboutSmartAntennas

UNIT	CONTENTS	HOURS
I	**ANTENNA FUNDAMENTALSAND WIREANTENNAS** Antenna Radiation Mechanism - Isotropic radiator- Antenna parameters : RadiationIntensity, Radiation pattern, Gain and Directivity, FBR, Effective Length, RadiationResistance, Antenna Impedance, Polarization, Beam width, Bandwidth, Antennatemperature- Friis transmission formula. Retarded Potential - Wire Antennas: Short ElectricDipole,Radiationfromanalternatingcurrentelement,Half-waveDipole, quarterwavemonopole-Fields,PowerradiatedandRadiationResistance.	9
II	**ANTENNAARRAYS** Types of arrays - Broad side, End fire, Collinear, Parasitic arrays. - Arrays of two pointsources - N-element of uniform linear arrays – Array of N elements with equal spacingand currents equal in magnitude and spacing (broad side array)- Array of N elementswithequalspacingandcurrentsequal inmagnitudebut withprogressivephaseshift (endfirearray)-Hansen-Woodyardarray-Pattern Multiplication-Binomialarrays.	9
III	**TRAVELLINGWAVEANDBROADBANDANTENNAS** Travelling wave radiators: basic concepts, Long wire antennas - field strengthcalculations and patterns - V-antennas, Rhombic Antennas, Small Loop antennas-Concept of short magnetic dipole, Helical Antennas, Folded Dipole Yagi-Uda Arrays,Log periodic antennas. Reflector Antennas: Huygens' principle - Flat Sheet and CornerReflectors,ParaboloidReflectors,CassegrainFeeds.Slotantenna s-Babinet's	9

	principle,Hornantennas,Lensantennas,Microstripantennas.	
IV	**WAVEPROPOGATION** Factors involved in the propagation of Radio Waves - Ground wave propagation,StructureofIonosphereanditseffectsonradiowaves-RefractionandReflectionofskywave by the ionosphere, Ray paths-Measures of Ionosphere propagation: criticalfrequency, skip distance, virtual height, Maximum usable frequency, Fading of signals:Selectivefading-Diversityreception,Spacewavepropagation-Considerationsin	9

	spacewavepropagation,Atmosphericeffectsinspacewavepropagation,Super Refraction-DuctWavePropagation.	
V	**SMARTANTENNAS** Concepts and Benefits of Smart antennas - Fixed weight beamforming-Adaptivebeamforming – Design of Planar array antennas for Beamforming applications – FeedtechniquesforPlanararrays-RoleofSmartAntennasinGreenCommunicationsand 5Gwirelesscommunications– SoftwareToolsforAntennaDesignandAnalysis	9

MaximumHours:45

CourseOutcomes

Oncompletionofthecourse,studentshouldbeableto

CO1-

Designlinearwireantennasforgivenspecifications.

CO2-Designlinearandnon-

linearantennaarraysforgivenbeamwidthandgain.CO3-

Analyzetheperformanceof ApertureandReflectorAntennas

CO4-Designmicrostripantennasforgivenspecifications.

CO5-

Analysetheproblemsassociatedwithradiowavepropagationintheatmosphere

CO6-Designplanarantennaarraysforbeamformingapplications.

TEXT/REFERENCEBOOKS

1. JohnD.Kraus,RonaldJMarhefkaandAhmadS.Khan,“AntennasandWavePropagation”,5th Edition,McGrawHill,2017.
2. Balanis,C.A.,“AntennaTheoryandDesign”,4thEdition,JohnWileyandSons,2016.
3. MohammadAbdulMatin,“Wideband,MultibandandSmartAntennaSystems,1stEdition,Springer,2021.
4. R.L. Yadava, “Antennas and Wave Propagation”, 2ndEdition, PHI Learning Private Limited, NewDelhi,2011.
5. Jordan,E.CandBalmainK.G,“ElectromagneticWavesandRadiatingSystems”,2ndEdition,PrenticeHallofIndia,2006.
6. K.D.PrasadandSatyaPrakasan,“AntennasandWavePropagation”,3rdEdition,TechIndia,NewDelhi,2003.

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SEC1403	OPTICALCOMMUNICATIONS (ForECEandETCE)	L	T	P	Credits	TotalMarks
		3	0	0	3	100

COURSEOBJECTIVES

To introducetheprincipleoflightpropagationthroughopticalfibers.Tounderstandsignaldistortionmechanismsinthefiber.

Tointroduceopticaltransmittersandreceiversforfiber/freespacelinksandthefiberopticcouplers,connectorsinvolved.

TointroduceopticalnetworkconceptsandcomponentsinvolvedanditsApplications.

UNIT1 INTRODUCTIONTOOPTICALFIBERS 9Hrs.

Basicsofopticalcommunicationsystem,lightpropagationinopticalfibers,Opticalspectralbands,Advantagesofoptical fiber communication over other communication systems, Ray theory and mode theory. Total internal reflection,Acceptanceangle,Numericalaperture,phaseandgroupvelocity,cutoffwavelength&groupdelay.Differenttypesofopticalfibers,refractiveindexprofiles& modetransmission.

UNIT2 TRANSMISSIONCHARACTERISTICSANDOPTICALAMPLIFIERS 9Hrs.

Characteristicsofopticalfibers:Attenuationduetoabsorption,scattering&bending,coreandcladdingloses,SignalDistortion in optical fibers: Intra modal Dispersion: Material & Waveguide dispersion; Intermodal dispersion: MMSI,MMGI &modalnoise.

Optical Amplifiers: Basic concepts, Erbium-Doped Fiber Amplifier, Raman amplifier -principles of operation,amplifiernoise,signaltonoiseratio,gain,gainbandwidth,intermodulationeffectsandwavelengthrangeofoperation.

UNIT3 OPTICALTRANSMITTERSANDRECEIVERS 9Hrs.

FiberopticTransmittermodule.Opticalsources-LEDs,LASERdiodes-Principlesofoperation:conceptsoflinewidth, phase noise, Optical detectors- P-I-N, Avalanche photodiodes : Principles of operation: concepts of responsivity,sensitivityandquantumefficiency,noiseindetection.FiberopticReceiver module.

UNIT4 COUPLERS,CONNECTORSANDOPTICALLINK 9Hrs.

Couplers: 2x2 coupler, Tap coupler, star coupler, Connectors: Cylindrical ferrule, Biconical Ferrule, Doubleeccentric, Splices: Fusion splices, Mechanical splices, Multiple splices. Design considerations in optical links, Point topoint Links: Link Power budget, Rise Time budget, Analog Links: CNR, Multichannel transmissiontechniques-MultichannelFrequencyModulation,Subcarriermultiplexing.

UNIT5 OPTICALNETWORKINGPRINCIPLESANDAPPLICATIONS. 9Hrs.

FDDI,WDM,SONET/SDH,ATM,IPoverWDM,OpticalLANStandards-IEEE802.3,Applications-Military

Max.45Hours

TEXT/REFERENCEBOOKS

1. GerdKaiser,"OpticalFiberCommunications",4thedition,Sixthreprint,TataMcGrawHill,NewDelhi,2009.
2. John M.Senior,"OpticalFiberCommunications-PrinciplesAndPractice",ThirdEdition,PearsonEducation,2010.
3. GerdKeiser,"OpticalcommunicationsEssentials",SpecialIndianEdition,TataMcGrawHill,NewDelhi,2008.
4. GovindP.Agrawal,"Fiber-OpticCommunicationSystems",ThirdEdition,JohnWiley&Sons,2004.
5. RajivRamasamy&KumarN.Sivarajan,"OpticalNetworks-APracticalPerspective",2Ed,MorganKauffman2002.

ENDSEMESTEREXAM QUESTIONPAPERPATTERN

Max.Marks:100 **ExamDuration:3Hrs.**

PARTA:10Questionsof2markseach-Nochoice **20Marks**

PARTB:2Questionsfromeachunitofinternalchoice,eachcarrying16marks **80Marks**

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SEC1407 (Revised)	OPTICAL COMMUNICATIONS	L	T	P	Credits	Total marks
		3	0	0	3	100

Pre requisite: NIL

Co Requisite: NIL

Course Objectives

- To introduce the principles of light propagation through optical fibers.
- To understand signal distortion mechanisms in the fiber.
- To introduce optical transmitters and receivers for fiber /free space links and the fiber optic couplers, connectors involved.
- To introduce optical network concepts and components involved and its applications.

UNIT	CONTENTS	HOURS
I	**INTRODUCTION TO OPTICAL FIBERS** Basics of optical communication system, light propagation in optical fibers, Optical spectral bands, Advantages of optical fiber communication over other communication systems, Ray theory and mode theory. Total internal reflection, Acceptance angle, Numerical aperture, phase and group velocity, cutoff wavelength & group delay. Different types of optical fibers, refractive index profiles & mode transmission.	9
II	**TRANSMISSION CHARACTERISTICS AND OPTICAL AMPLIFIERS** Characteristics of optical fibers: Attenuation due to absorption, scattering & bending, core and cladding loses, Signal Distortion in optical fibers: Intra modal Dispersion: Material & Waveguide dispersion; Intermodal dispersion: MMSI, MMGI & modal noise. Optical Amplifiers: Basic concepts, Erbium-Doped Fiber Amplifier, Raman amplifier -principles of operation, amplifier noise, signal to noise ratio, gain, gain bandwidth, intermodulation effects and wavelength range of operation.	9
III	**OPTICAL TRANSMITTERS AND RECEIVERS** Fiber optic Transmitter module. Optical sources- LEDs, LASER diodes- Principles of operation: concepts of line width, phase noise, Vertical cavity surface emitting laser. Optical detectors-P-I-N, Avalanche photodiodes, Resonant cavity enhancement ,Photodetector : Principles of operation: concepts of responsivity, sensitivity and quantum efficiency, noise in detection. Fiber optic Receiver module.	9
IV	**COUPLERS, CONNECTORS AND OPTICAL LINK** Couplers: 2x2 coupler, Tap coupler, star coupler, Connectors: Cylindrical ferrule, Biconical Ferrule, Double eccentric, Splices: Fusion splices, Mechanical splices, Multiple splices. Design considerations in optical links, Point to point Links: Link Power budget, Rise Time budget, Analog Links: CNR, Multichannel transmission techniques-Multichannel Frequency Modulation, Subcarrier multiplexing.	9
V	**OPTICAL NETWORKS, COMPONENTS AND APPLICATIONS** Optical LAN Standards-IEEE802.3, Optical OFDM, High-speed Light-Waveguides, Reconfigurable optical add/drop multiplexer, Light-Fidelity (Li-Fi)	9

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	Technology-Introduction, working principle, Comparison of Li-Fi and Wi-Fi, Li-Fi networks, Applications.Case study: Evaluation of building a Fiber Optic network	

Maximum Hours: 45

Course Outcomes

On completion of the course, the student should be able to

CO1-Apply the mathematical concepts to compare different types of optical fibers, modes and configuration

CO2-Analyze the transmission characteristics of optical fibers

CO3-Examine the optical sources and detectors for use in optical communication system

CO4-Construct launching and coupling of optical fibers

CO5-Design high speed optical communication networks

CO6-Design wireless communication system using Li-Fi

TEXT / REFERENCE BOOKS

1. Gerd Kaiser, "Optical Fiber Communications", 4th edition, Sixth reprint, Tata Mc Graw Hill, New Delhi,2009.
2. John M. Senior, "Optical Fiber Communications- Principles And Practice", Third Edition, Pearson Education, 2010.
3. Govind P. Agrawal, " Fiber-Optic Communication Systems", Third Edition, John Wiley & Sons, 2004.
4. Rajiv Ramasamy & Kumar N. Sivarajan, "Optical Networks - A Practical Perspective", 2 Ed, Morgan Kauffman 2002.
5. Svilen Dimitrov & Harald Haas, " Principles of LED Light Communications: Towards Networked Li-Fi, Cambridge University Press, 2015

SECA3003	**EMBEDDEDPROCESSORS**	**L**	**T**	**P**	**Credits**	**TotalMarks**
		3	**0**	**0**	**3**	**100**

COURSEOBJECTIVES

- TounderstandthearchitectureofPIC,ARMandDSPprocessor.
- TofamiliarisethestudentsinwritingassemblyprogrammingandinterfacingwithPeripheralsusingPICMicrocontroller.
- TounderstandthedifferencebetweenMicrocontrollerandDSPprocessor.

UNIT1 INTRODUCTIONTOPICMICROCONTROLLERS 9Hrs.

Introduction to PIC – CompareVon Neumann architecture and Harvard architecture, RISC Vs CISC - Features of PIC -ArchitectureofPIC16F8XX-PinConfiguration-Addressingmodes-Instructionset-SimplePrograms.

UNIT2 PICONCHIPPERIPHERALS 9Hrs.

Memory-CoreSFR-Interrupts-I/OPorts-Timers-CCPmodules-CaptureMode-CompareMode-PWMMode-Serialcommunicationmodule-USART-SPIinterface-I2CinterfaceAnalogComparator,ADC.

UNIT3 APPLICATIONSUSINGPIC 9Hrs.

ProgrammingLanguages-Compilers-Assemblers-Directives–MPLABIDE-Interfacing-Switches&Pushbuttons-LEDs
-sevensegmentdisplays-LCD-KeypadInterfacing,Timerapplications-CasestudyTemperaturemonitoringSystem-CasestudyDigitalClock.

UNIT4 ARMPROCESSOR 9Hrs.

ArchitectureofARMController–Registers,Pipelineorganization3stage&5stage,Thumbmodeofoperation-D/AandA/D converter, sensors, actuators and their interfacing – Case study- Temperature sensing, Light sensing, Introduction toInternetofThings,smarthomeconcepts.

UNIT5 DSPPROCESSORS 9Hrs.

Introduction - fixed and floating point –Core architecture of ADSP218X- Arithmetic Logic Unit (ALU) – Multiplier andAccumulator (MAC) Unit- Barrel Shifter-Data Address Generator (DAG)- Program Sequencer- Functional Diagram ofTMS320C54XX.

Max:45Hrs.

COURSEOUTCOME

Oncompletionofthecourse,studentwillbeableto
CO1-UnderstandingarchitectureandfunctionofPICmicrocontrollers.
CO2-ExplainthediscussionofonchipperipheralsofPICmicrocontrollers.
CO3-DoassemblyandCprogramexercisewithvariousI/Omodules.
CO4-UnderstandthearchitectureofARM.
CO5-
UnderstandtheneedofDSPprocessorforsignalprocessingapplicationsanditsarchitecture.CO
6-Designreal-timeapplicationusingPICMicrocontroller.

TEXT/REFERENCEBOOKS

1. DannyCausey,RolinMcKinlay,MuhammadAliMazidi,"PICMicrocontrollerandEmbeddedSystems:UsingassemblyandCforPIC18",1st Edition,MicroDigitalEdition;2nd Edition,2016.
2. AndrewSloss,DominicSymes,ChrisWright,"ARMSystemDeveloper'sGuide:DesigningandOptimizingSystemSoftware",Elsevier,1st Edition,2004.
3. F.VahidandT.Givargis,"EmbeddedSystemDesign:AUnifiedHardware/SoftwareIntroduction",WileyIndiaPvt.Ltd., 2002.
4. BVenkataramaniMBhaskar,"DigitalSignalprocessorsArchitecture,ProgrammingandApplications",TataMcGraw Hill,2nd Edition,2002.

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USEFULLINKS

1. https://www.mikroe.com/ebooks/pic-microcontrollers-programming-in-c
2. www.analog.com.
3. www.ti.com.
4. www.dspguide.com.
5. https://swayam.gov.in/courses/5424-jan-2019-embedded-system-design-with-arm

ENDSEMESTEREXAMINATIONQUESTIONPAPERPATTERN

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Sathyabama Institute of Science and Technology

Department of Electronics and Communication Engineering

SECA3019	EMBEDDED PROCESSORS	L	T	P	Credits	Total marks
		3	0	0	3	100

Pre requisite: Nil	Co Requisite: Nil

Course Objectives

- To analyze the features of various embedded processors
- To analyze the On-chip peripherals
- To develop ARM processor-based applications
- To design innovative applications by interfacing the processors with real world
- To analyze various ARM cortex processors
- To develop firmware for ARM cortex processors

UNIT	CONTENTS	HOURS
I	**INTRODUCTION TO EMBEDDED PROCESSORS** Introduction to embedded processors– Compare Von Neumann architecture and Harvard architecture, RISC Vs CISC – System on Chip (SoC)-Introduction to SoC Architecture, An approach for SOC Design, System Architecture and Complexity. Processor Selection for SOC, Basic concepts in Processor Architecture, Overview of SOC external memory, Internal Memory, Scratchpads and Cache memory, SOC Memory System, Models of Simple Processor – memory interaction, SOC Standard Buses	9
II	**EMBEDDED PROCESSORS ON CHIP PERIPHERALS** Memory - Interrupts - I/O Ports-Timers & Real Time Clock (RTC), Watch dog timer - CCP modules - Capture Mode - Compare Mode-PWM Mode - Serial communication module - USART - SPI interface - I2C interface, Analog Comparator, Analog interfacing and data acquisition.	9
III	**ARM PROCESSOR** Architecture of ARM Controller – Registers, Pipeline organization 3 stage & 5 stage, Thumb mode of operation - D/A and A/D converter, sensors, actuators and their interfacing – Case study- Digital clock, Temperature sensing, Light sensing, Introduction to Internet of Things, smart home concepts	9
IV	**REAL WORLD INTERFACING USING ARM PROCESSOR** Interfacing the peripherals to LPC2148: GSM and GPS using UART, on-chip ADC using interrupt (VIC), EEPROM using I2C, SD card interface using SPI, on-chip DAC for waveform generation.	9
V	**ARM CORTEX PROCESSORS** Introduction to ARM CORTEX series, improvement over classical series and advantages for embedded system design. CORTEX A, CORTEX M, CORTEX R processors series, versions, features and applications, need of operating system in developing complex applications in embedded system, Firmware development for ARM Cortex, Survey of CORTEX M3 based controllers, its features and comparison	9

Maximum Hours: 45

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Course Outcomes

On completion of the course, the student will be able to

CO1-Analyze the architectures of different Embedded Processors

CO2-Identify an appropriate on chip peripherals for serial and parallel communication

CO3-Examine the functions of ARM processors

CO4-Develop real time applications using ARM processors

CO5-Develop a firmware for embedded applications

CO6-Develop innovative products using Embedded processors

TEXT / REFERENCE BOOKS

1. F. Vahid and T. Givargis, “Embedded System Design: A Unified Hardware/Software Introduction”, Wiley India Pvt. Ltd., 2002.
2. Michael J. Flynn and Wayne Luk, “Computer System Design System-on-Chip”, Wiley India Pvt. Ltd.
3. Steve Furber, “ARM System on Chip Architecture “, 2nd Edition, 2000, Addison Wesley Professional.
4. S. Pascricha and N. Dutt, Morgan Kaufmann, On-Chip Communication Architectures, System on Chip Interconnect, -Elsevier Publishers 2008
5. Mark Fisher, “ARM Cortex M4 Cookbook”, Packt Publishing, 2016.
6. Lyla B. Das, “Architecture, Programming and Interfacing of Low-power Processors ARM 7, Cortex-M”, Cengage, 1st Edition, 2017.
7. Joseph Yiu, “The Definitive Guide to the ARM Cortex-M3”, Newness, 2nd Edition, 2009