Third Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1	CC	ECC302	Electronics Devices	3	0	2	4
2	CC	ECC303	Digital System Design	3	0	2	4
3	CC	ECC304	Signals and Systems	3	0	1	4
4	GE	ECC305	Network Theory	3	0	1	4
5	GS	GSC303	ESP & SDP - III	0	2	0	2
6	BSC	BSC--	Mathematics	3	1	0	4
7	NPT	NPT301	(NPTEL)	-	-	-	1
			Total Credits				23

NPTEL courses are based on the respective year's offered course

Suggestive Choice Based Subjects

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1	BSC	BSC007	Mathematics - Calculus and Vector Calculus	3	1	0	4
2	BSC	BSC008	Mathematics - Calculus & Differential Equation	3	1	0	4
3	BSC	BSC009	Mathematics - Probability and Statistics	3	1	0	4
4	BSC	BSC010	Mathematics - Discrete Mathematics	3	1	0	4
5	**BSC**	**BSC011**	**Mathematics - Transform Calculus, Numerical Methods & Complex Variable**	**3**	**1**	**0**	**4**
6	BSC	BSC012	Mathematics - Probability, Statistics & Stochastic Process	3	1	0	4
7	BSC	BSC013	Mathematics - Graph Theory	3	1	0	4

ELECTRONICS DEVICE
ECC302
L-T-P= 3-0-2

Introduction:

The branch of physics that deals with the study of rigid solid matter is called Solid state physics. It is done through a variety of methods including quantum mechanics, electromagnetism, metallurgy andcrystallography and forms the theoretical foundation of materials science as a whole. The basic functionof solid state physics is to study how the atomic properties of a solid material affects its overall properties.Solid-state electronics are those circuits or devices built entirely from solid materials and in which theelectrons, or other charge carriers, are confined entirely within the solid material. The term is often usedto contrast with the earlier technologies of vacuum and gas-discharge tube devices, and it is alsoconventional to exclude electro-mechanical devices (relays, switches, hard drives and other devices withmoving parts) from the term solid state. Common solid-state devices include transistors, microprocessorchips, and RAM. More recently, the integrated circuit (IC), the light-emitting diode (LED), and the liquid- crystal display (LCD) have evolved as further examples of solid-state devices.

Objectives:

- Describe crystal properties and growth of semiconductors.
- Apply basic quantum mechanics to atomic and semiconductor models.
- Derive equations of charge transport in semiconductors under normal operating conditions.
- Determine charge, electric field, potential distributions, and energy band diagrams in pn-junctiondiodes under normal operating conditions.
- Apply the charge diffusion equation to pn-junction diodes and bipolar junction transistors, and deriveI-V characteristics for diodes and transistors, and small-signal admittance and transient response fordiodes.
- Derive I-V characteristics of field-effect-transistors.
- Discuss the fundamental applications of photodiodes, solar cells, and light-emitting diodes.
- List fabrication steps used in production of pn-junction diodes and various types of transistors.
- Describe the impact of electronics on the technology and contemporary issues in solid-stateelectronics.

Learning Outcomes:

Knowledge:

1. To acquire knowledge about semiconductor physics for intrinsic and extrinsic materials.

2. To learn the basics of semiconductor diodes, BJTs and their small signal and high frequency analysis.

3. To study and analyze the performance of FETs on the basis of their operation and working.

4. To study and analyze the rectifier and regulated circuits.

Application:

1. Electronic devices such as mobiles and computers
2. Optical devices such as lasers and fiber optics
3. Magnet based devices such as Magnetic Resonance Imaging (MRI) and vibrating devices
4. Silicon based logic and memory bits

Course Contents:

Module 1:
Introduction to Semiconductor Physics:Review of Quantum Mechanics, Electrons in periodicLattices, E-k diagrams. Energy bands in intrinsic and extrinsic silicon; Carrier transport: diffusioncurrent, drift current, mobility and resistivity; sheet resistance, design of resistors
Module 2:
Generation and recombination of carriers; Poisson and continuity equation P-N junctioncharacteristics, I-V characteristics, and small signal switching models; Avalanche breakdown, Zenerdiode, Schottky diode
Module 3:
Bipolar Junction Transistor, I-V characteristics, Ebers-Moll Model,MOS capacitor, C-Vcharacteristics, MOSFET, I-V characteristics, and small signal models of MOS transistor, LED,photodiode and solar cell;
Module 4:
Integrated circuit fabrication process: oxidation, diffusion, ion implantation, photolithography,etching, chemical vapor deposition, sputtering, twin-tub CMOS process.

Text Books
1. Neamen- Semiconductor Physicsand Devices, TMH
2. BhattacharyaSharma-SolidStateElectronicDevices- Oxford

References
1. Singh &Singh- Electronics Devices and Integrated Circuits–PHI
2. Bogart,Bisley&Rice- ElectronicsDevices and Circuits- Pearson
3. Kasap-PrinciplesofElectronicMaterialsandDevices- TMH
4. Boylestad&Nashelsky- ElectronicsDevices and CircuitTheory- Pearson
5. Salivahanan,Kumar&Vallavaraj- ElectronicsDevices and Circuits- TMH
6. Maini&Agrawal- ElectronicsDevices and Circuits- Wiley

DIGITAL SYSTEM DESIGN

ECC303

L-T-P= 3-0-2

Introduction:

This course examines about Digital Electronics circuit. The Topics to be covered (tentatively) include:

• Data and Number System
• Boolean algebra
• Combinational Circuit

• Sequential Circuit
• A/D converter and D/A converter
• Memory system

Objectives:

- To acquire knowledge on basics of digital circuits and its applications.
- This course deals with the basics of Boolean algebra, Digital principles and circuits.
- The course starts with the basics of Boolean algebra and Boolean expression minimization techniques. Then it explains simple combinational networks like Multiplexers, decoders etc.
- Sequential and combinational digital circuits are the building blocks ofany processor, irrespective of its application.
- After this the difference between the combinational technologies and sequential circuits is dealt with. Finally, it gives the method to realize the basic gates using different technologies.

Learning Outcomes:

Once the student has successfully completed this course, he/she will be able to answer the following questions or perform following activities:

1. Able to explain the basic concepts of digital electronics circuits
2. Able to describe different types of logics, complexity, circuit specifications.
3. On successful completion of this Course, the students would be able to minimize functions usingany type of minimizing algorithms (Boolean algebra, Karnaugh map).
4. Define the problem (Inputs and Outputs), write its functions. Implement functions using digitalcircuit (Combinational or Sequential) and knowledge in analyzing and designing procedures of Combinational and Sequential circuits.
5. To be able to differentiate electronic from electrical systems and identify the basic blocks in anyelectronic system

Course Contents:

Module 1:
Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and DeMorgan'sTheorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 6 variables, Binarycodes, CodeConversion.

Module 2:
MSI devices like Comparators, Multiplexers, Encoder, Decoder, Driver & Multiplexed Display, Half andFull Adders, Subtractors, Serial and Parallel Adders, BCD Adder, Barrel shifter and ALU.Sequential Logic Design: Building blocks like S-R, JK and Master-Slave JK FF, Edge triggered FF,Rippleand Synchronous counters, Shift registers, Finite state machines, Design of synchronousFSM,Algorithmic State Machines charts. Designing synchronous circuits like Pulse train generator,PseudoRandom Binary Sequence generator, Clock generation

Module 3:
Logic Families and Semiconductor Memories: TTL NAND gate, Specifications, Noise margin,Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing,Memory elements, Conceptof Programmable logic devices like FPGA. Logic implementation usingProgrammable Devices.

Module 4:

VLSI Design flow: Design entry: Schematic, FSM & HDL, different modelling styles in VHDL, Data typesand objects, Dataflow, Behavioural and Structural Modelling, Synthesis and SimulationVHDL constructs and codes for combinational and sequential circuits.

Text Books

1. A.Anand Kumar, Fundamentals of Digital Circuits- PHI
2. A.K.Maini- Digital Electronics- Wiley-India
3. Kharate- Digital Electronics- Oxford

SIGNALS AND SYSTEMS

ECC304

L-T-P= 3-0-0

Introduction:

This tutorial covers the basics of signals and system necessary for understanding the concepts of digital image processing. Before going into the detail concepts, lets first define the simple terms Signals. In electrical engineering, the fundamental quantity of representing some information is called a signal. It does not matter what the information is i-e: Analog or digital information. In mathematics, a signal is a function that conveys some information. In fact any quantity measurable through time over space or any higher dimension can be taken as a signal. A signal could be of any dimension and could be of any form.

Learning Outcomes:

Knowledge:

- Demonstrate an understanding of the fundamental properties of linear systems, by explaining theproperties to others.
- Use linear systems tools, especially transform analysis and convolution, to analyze and predictthe behavior of linear systems
- Gain an appreciation for the importance of linear systems analysis in aerospace systems.

Measurable outcomes (assessment method):

1. Explain the importance of superposition in the analysis of linear systems.(concept test,homework, quiz)
2. Explain the role of convolution in the analysis of linear time invariant systems, and useconvolution to determine the response of linear systems to arbitrary inputs. (concept test,homework, quiz)
3. List and apply properties of the unilateral and bilateral Laplace transforms.(concept test,homework, quiz)
4. Use Laplace transforms to solve differential equations, and to determine the response of linearsystems to known inputs. (homework, quiz)
5. Demonstrate an understanding of the relationship between the stability and causality of systemsand the region of convergence of their Laplace transforms, by correctly explaining therelationship, and

using the relationship to determine the stability and causality of systems.(concept test, homework, quiz)

6. Demonstrate an understanding of the relation among the transfer function, convolution, and theimpulse response, by explaining the relationship, and using the relationship to solve forcedresponse problems. (concept test, homework, quiz)
7. Explain the relationship between a signal's bandwidth and its duration, and use that relationshipto predict and explain the bandwidth requirements for aerospace applications such as Lorannavigation, amplitude modulation, etc.(homework, quiz)
8. Explain the fundamentals of modulation, including amplitude modulation, frequency modulation,and sampling (impulse modulation), including the implications of the sampling theorem.(homework, quiz)

Course Content:

Module 1:

Introduction to Signals and Systems:Signals and systems as seen in everyday life, and in various branches of engineering and science.Signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability. Examples.

Module 2:

Behaviour of continuous and discrete-time LTI systems: Impulse response and step response, convolution, input-output behaviour with aperiodic convergentinputs, cascade interconnections. Characterization of causality and stability of LTI systems. System representation through differential equations and difference equations. State-space Representation of systems. State-Space Analysis, Multi-input, multi-output representation. State Transition Matrix andits Role. Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response.

Module 3:

Fourier, Laplace and z- Transforms: Fourier series representation of periodic signals, Waveform Symmetries, Calculation of FourierCoefficients. Fourier Transform, convolution/multiplication and their effect in the frequency domain,magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behaviour. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis.

Module 4:

Sampling and Reconstruction: The Sampling Theorem and its implications. Spectra of sample signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects. Relation between continuousand discrete time systems. Introduction to the applications of signal and system theory: modulation for communication, filtering, feedback control systems.

Text Books

1. A.V. Oppenheim, A.S. Willsky and S.H. Nawab -Signals & Systems, Pearson
2. S.Haykin&B.V.Veen, Signals and Systems- John Wiley
3. A. NagoorKani- Signals and Systems- McGraw Hill

ReferenceBooks

1. J.G. Proakis&D.G.Manolakis- Digital Signal Processing Principles, Algorithms and Applications, PHI.
2. C-T Chen- Signals and Systems- Oxford
3. E W Kamen&BS Heck- Fundamentals of Signals and Systems Using the Web and Matlab- Pearson
4. B.P. Lathi- Signal Processing & Linear Systems- Oxford
5. P. Ramesh Babu&R.Anandanatarajan- Signals and Systems 4/e- Scitech
6. M.J. Roberts, Signals and Systems Analysis using Transform method and MATLAB, TMH
7. S Ghosh- Signals and Systems- Pearson
8. M.H. Hays- Digital Signal Processing ", Schaum's outlines, TMH
9. Ashok Ambardar, -Analog and Digital Signal Processing- Thomson.
10. Phillip, Parr &Riskin- Signal, Systems and Transforms- Pearson

NETWORK THEORY

ECC305

L-T-P= 3-0-2

Introduction:

This course explores the different types of network and circuits. It also helps in analysis signals andsystems alongside the knowledge of switching and the corresponding response in a network. The Topicsto be covered (tentatively) include:

- Electrical systems
- Different network theorems
- Analysis of signals
- Analysis of transient behavior in electrical systems
- Two port network
- Network topology
- Filters

Objectives:

To develop the fundamental tools of linear circuit analysis which will be useful to all engineers. To learnthe details of circuits analysis including the network elements, sources and operational amplifiers. Toprepare students for more advanced courses in circuit analysis.

Learning Outcomes:

Knowledge:

1. Identify linear systems and represent those systems in schematic form
2. Apply Kirchhoff's current and voltage laws and Ohm's law to circuit problems
3. Simplify circuits using series and parallel equivalents and using Thevenin and Nortonequivalents
4. Simplify and analyze the magnetically coupled circuits.
5. Identify and model first and second order electric systems involving capacitors and inductors
6. Predict the transient behavior of first and second order circuits

Application:

- The application of this course is immense and vivid, anything that is electrically operated can be analyzed and understood with the help of the understanding this subject.

Course Contents:

Module 1:

Node and Mesh Analysis, matrix approach of network containing voltage and current sources, and reactance, source transformation and duality. Network theorems: Superposition, reciprocity, Thevenin's, Norton's, Maximum power Transfer, compensation and Tallegen's theorem as applied to AC. circuits. Trigonometric and exponential Fourier series: Discrete spectra and symmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs, power factor,effective values, Fourier transform and continuous spectra, three phase unbalanced circuit and power calculation.

Module 2:

Laplace transforms and properties: Partial fractions, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions.

Module 3:

Transient behaviour, concept of complex frequency, Driving points and transfer functions poles and zeros of immittance function, their properties, sinusoidal response from pole-zero locations, convolution theorem and Two four port network and interconnections, Behaviours of series and parallel resonant circuits, Introduction to band pass, low pass, high pass and band reject filters.

Text Books

1. S P Ghosh, A K Chakraborty, Network Analysis and Synthesis- McGraw Hill.

References

1. C. K. Alexander, M. N. O. Sadiku, *Fundamentals of Electric Circuits (Fifth Edition)*, McGraw Hill, 2013.
2. Introduction to Electric Circuits, R. C. Dorf, Wiley 1993 (second edition)
3. D. E. Johnson, J. R. Johnson, J. L. Hilburn, and P. D. Scott, *Electric Circuit Analysis*, Third Edition, Prentice-Hall 1997.
4. 4.Electric Circuit, M. Nahvi& J. Edminister, Schaum's outline series, The Mc Graw HillCompany.

Fourth Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1	CC	ECC406	Analog & Digital Communication	3	0	2	4
2	CC	ECC407	Analog Circuits	3	0	2	4
3	CC	ECC408	Microprocessor & Microcontrollers	3	0	2	4
4	BSC	BSC---	Mathematics	3	1	0	4
5	GE	CSC403	Advanced OOPS using C++	2	0	2	3
6	GS	GSC404	ESP & SDP - IV	0	2	0	2
7	NPT	NPT401	(NPTEL)	-	-	-	1
			Total Credits				22

NPTEL courses are based on the respective year's offered course

Suggestive Choice Based Subjects

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1	BSC	BSC007	Mathematics - Calculus and Vector Calculus	3	1	0	4
2	BSC	BSC008	Mathematics - Calculus & Differential Equation	3	1	0	4
3	BSC	BSC009	Mathematics - Probability and Statistics	3	1	0	4
4	BSC	BSC010	Mathematics - Discrete Mathematics	3	1	0	4
5	BSC	BSC011	Mathematics - Transform Calculus, Numerical Methods & Complex Variable	3	1	0	4
6	**BSC**	**BSC012**	**Mathematics - Probability, Statistics & Stochastic Process**	**3**	**1**	**0**	**4**
7	BSC	BSC013	Mathematics - Graph Theory	3	1	0	4

ANALOG AND DIGITAL COMMUNICATION

ECC406

L-T-P= 3-0-2

Introduction:

This course presents the fundamentals of analog communications. Topics include:

• the analysis of signals and systems

• amplitude modulation/demodulation and frequency modulation/demodulation

• phase modulation and demodulation

• Super heterodyne receiver

• Noise performance of different AM and FM system

• Random process, stochastic process and ergodic process

• Signal vector representation and Grahm Schmidt orthogonalization procedure

• Receiver design and sufficient statistics

• Line coding, band pass communication

• Modulation techniques, Inter symbol Interference

Objectives:

To introduce the concepts of analogue communication systems, and to equip students with various issues related to Analog communication such as modulation, demodulation, transmitters and receivers and noise performance.Digital communication uses electrical signalling methods to transmit information over a physical channel separating a transmitter and receiver with the channel properties often time varying. This course presents the theory and practice of digital communication including signal design, modulation methods, demodulation methods, wireless channel basics and the application of this to the design of modern OFDM systems.

Learning Outcomes:

Knowledge:

- The learner must be able to appreciate the need for modulation and calculate the antenna size for different carrier frequencies.
- From the functional representation of the modulated carrier wave, the learner must be able to identify the type of modulation, calculate the side-band frequencies, identify the modulating and carrier frequencies, decide the type of generation method to be adopted.
- After understanding the basic concepts the learner must be able to compare between the different demodulation methods, design an envelope detector, calculate the IF and image frequencies for the super heterodyne receivers given the carrier and modulating frequencies, calculate the oscillator frequency.
- From the functional representation of the modulated carrier wave, the learner must be able to identify the type of modulation, calculate the side-band frequencies, identify the modulating and carrier frequencies, decide the type of generation method to be adopted.

- Appreciate the importance of Multiplexing, find out their application areas.
- ThelearnermustbeabletocalculatetheNoisetemperature and SNR for differentsystems, also comparebetweentheperformance of thedifferentmodulation methodsbycomparingtheir SNR.

Application:

1. The ability to design and analyze basic analog transmitters and receivers
2. The ability to apply computer software for the design and analysis of a simple analog communication system.

Course Contents:

Module 1:
Review of signals and systems, Frequency domain representation of signals, Principles ofAmplitudeModulation Systems- DSB, SSB and VSB modulations. Angle Modulation,Representation of FM and PM signals, Spectral characteristics of angle modulated signals.

Module 2:
Review of probability and random process. Gaussian and white noise characteristics,Noise inamplitude modulation systems, Noise in Frequency modulation systems. Pre-emphasis and Deemphasis,Threshold effect in angle modulation.

Module 3:
Pulse modulation. Sampling process. Pulse Amplitude and Pulse code modulation(PCM), Differential pulse code modulation. Delta modulation, Noise considerations in PCM, TimeDivision multiplexing, Digital Multiplexers.

Module 4:
Elements of Detection Theory, Optimum detection of signals in noise,Coherent communication withwaveforms- Probability of Error evaluations. BasebandPulse Transmission- Inter symbolInterference and Nyquist criterion.Pass band Digital Modulation schemes- Phase Shift Keying,Frequency Shift Keying,Quadrature Amplitude Modulation, Continuous Phase Modulation andMinimum Shift Keying.

Module 5:
Digital Modulation trade-offs. Optimum demodulation of digital signals over band-limited channels- Maximum likelihood sequence detection (Viterbi receiver). Equalization Techniques.Synchronization and Carrier Recovery for Digital modulation.

Text Books

1. DigitalCommunications,S.Haykin,Wiley India.
2. Principlesof CommunicationSystems,H.Taub and D.L.Schilling,TMH PublishingCo.
3. ModernDigitalandAnalog CommunicationSystems,B.P.LathiandZ.Ding, OxfordUniversityPress
4. B.P. Lathi, Zhi Ding, Modern Digital and Analog Communication Systems, 4thed, Oxford Publication.
5. TaubandSchilling, “Principlesof Communication Systems”,2nded., Mc-GrawHill.

References

1. DigitalCommunications, J.G.Proakis,TMHPublishing Co.
2. DigitalCommunication,A.Bhattacharya,TMH PublishingCo.
3. P Ramakrishna Rao, Analog Communication, Tata McGraw Hill Education
4. Singh &Sapre—CommunicationSystems:2/e,TMH.
5. V ChandraSekar–Analog Communication- OxfordUniversityPress

ANALOG CIRCUITS

ECC407

L-T-P= 3-0-2

Introduction:

This course examines bipolar junction transistor biasing concept, operational amplifier and different types of filters and tuned amplifiers circuit and their application. The Topics to be covered (tentatively) include:

- Graduate will be able to understand the basic properties of electronic system
- Graduate will be able to understand different type of diode and their applications
- Graduate will acquire knowledge on bipolar junction transistor and applications
- Graduate will acquire knowledge of mosfet and circuits
- Graduate will acquire knowledge of voltage and power
- Graduate will get knowledge on feedback in amplifiers and oscillator
- Graduates will be able to understand and apply knowledge differential amplifier
- Graduates will be able to understand on operational amplifier and its applications
- Graduates will be able to understand and apply knowledge filters and tuned amplifiers
- Graduate will acquire knowledge of waveform generation and shaping circuit

Objectives:

The Course Educational Objectives are:

- An understanding of basic EE abstractions on which analysis and design of electrical and electronic circuits and systems are based, including lumped circuit, digital and operational amplifier abstractions.
- The capability to use abstractions to analyze and design simple electronic circuits.
- The ability to formulate and solve the differential equations describing time behavior of circuits containing energy storage elements.
- An understanding of how complex devices such as semiconductor diodes and field-effect transistors are modeled and how the models are used in the design and analysis of useful circuits. The capability to design and construct circuits, take measurements of circuit behavior and performance, compare with predicted circuit models and explain discrepancies.

Learning Outcomes:

Knowledge:

Once the student has successfully completed this course, he/she will be able to answer the following questions or perform following activities:

1. Learn how to develop and employ circuit models for elementary electronic components, e.g., resistors, sources, inductors, capacitors, diodes and transistors.
2. Become adept at using various methods of circuit analysis, including simplified methods such as series-parallel reductions, voltage and current dividers, and the node method.
3. Appreciate the consequences of linearity, in particular the principle of superposition and Thevenin-Norton equivalent circuits.

4. Gain an intuitive understanding of the role of power flow and energy storage in electronic circuits.
5. Develop the capability to analyze and design simple circuits containing non-linear elements such as transistors using the concepts of load lines, operating points and incremental analysis.
6. Learn how the primitives of Boolean algebra are used to describe the processing of binary signals and to use electronic components such as MOSFET's as building blocks in electronically implementing binary functions
7. Learn how the concept of noise margin is used to provide noise immunity in digital circuits. Be introduced to the concept of state in a dynamical physical system and learn how to analyze simple first and second order linear circuits containing memory elements.
8. Be introduced to the concept of singularity functions and learn how to analyze simple circuits containing step and impulse sources Be introduced to the concept of sinusoidal-steady-state (SSS) and to use impedance methods to analyze the SSS response of first and second-order systems
9. Gain insight into the behavior of a physical system driven near resonance, in particular the relationship to the transient response and the significance of the quality factor Q. Learn how operational amplifiers are modeled and analyzed, and to design Op-Amp circuits to perform operations such as integration, differentiation and filtering on electronic signals

Application:

1. To understand the principles of gain and loss and the function of amplifiers using analog circuits element.
2. Use of simulation program with integrated circuit emphasis (SPICE)/electronic computer aided design (ECAD) techniques to analyze and develop circuits.
3. Use of prototyping methods eg breadboard, strip board, printed circuit board (PCB); typical circuits eg filter, amplifier, oscillator, transmitter/receiver, power control, circuits/systems with telecommunication applications

Course Contents:

Module 1:

Diode Circuits, Amplifiermodels: Voltage amplifier, current amplifier, trans-conductance amplifierand trans-resistance amplifier. Biasing schemes for BJT and FET amplifiers, bias stability, variousconfigurations (such as CE/CS, CB/CG, CC/CD) and their features, small signal analysis, lowfrequency transistor models, estimation of voltage gain, input resistance, output resistance etc.,design procedure for particular specifications, low frequency analysis of multistage amplifiers.

Module 2:

High frequency transistor models, frequency response of single stage andmultistage amplifiers,cascade amplifier. Various classes of operation (Class A, B, AB, C etc.), their power efficiency andlinearity issues. Feedback topologies: Voltage series, current series, voltage shunt, current shunt,effect of feedback on gain, bandwidth etc., calculation with practical circuits, concept of stability,gain margin and phase margin.

Module 3:

Oscillators: Review of the basic concept, Barkhausen criterion, RC oscillators(phase shift, Wienbridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), non-sinusoidal oscillators.Current mirror: Basic topology and its variants, V-I characteristics, outputresistance and minimumsustainable voltage (VON), maximum usable load. Differential amplifier: Basic structure andprinciple of operation, calculation of differential gain, common mode gain, CMRR and ICMR. OPAMPdesign: design of differential amplifier for a given specification, design of gain stages andoutput stages, compensation.

Module 4:

OP-AMP applications: review of inverting and non-inverting amplifiers, integratorand differentiator, summing amplifier, precision rectifier, Schmitt trigger and its applications. Active filters: Low pass, high pass, band pass and band stop, design guidelines.

Module 5:

Digital-to-analog converters (DAC): Weighted resistor, R-2R ladder, resistorstring etc. Analog-todigital converters (ADC): Single slope, dual slope, successive approximation, flash etc. Switchedcapacitor circuits: Basic concept, practical configurations, application in amplifier, integrator,ADC etc.

Text Books

1. Microelectronic Circuits – Sedra and Smith(Fifth Edition) (Oxford)
2. Electronic Devices and Circuit theory – Boylestead and Nashesky – PHI/Pearson Education
3. Millman and Halkias – Integrated Electronics – TMH Op Amp and Linear Ics.
4. Electronics–fundamental— D Chattopadhaya& P. C. Rakhit
5. Linear integrated circuits-D. Roy Choudhury, ShailB. Jain

References

1. R. A. Gackward – PHI/Pearson Education
2. Sergio Franco – Operational Amplifier (JMH)
3. Electronics Devices and Circuits----S SalivahananN.SureshkumarA.Vallavaraj

MICROPROCESSOR & MICROCONTROLLERS

ECC408

L-T-P= 3-0-2

Introduction:

This course examines thebasic concepts of digital number system, the evolution of general purposeprocessor, concept of 8085 and its related programming. The basic concept of 8086 and 8051.The Topicsto be covered (tentatively) include:

- Introduction of microcomputer based system
- Architecture of 8085 and its pinout diagram
- Addressing mode and timing diagram of 8085
- Programming concept of 8085
- Serial and parallel data communication
- Architecture of 8086 and its assembly language programming
- Architecture of 8051 and its assembly language programming
- Memory and peripheral interfacing with 8085

Objectives:

In this course, we will study the basic architecture of 8085, 8086 and 8051.Impart the knowledgeabout the instruction set of 8085, 8086 and 8051.Understand the basic idea about the datatransfer schemes and its applications. This course will develop the simple program skill writingon 8051, 8086 & 8085 environment. After completed the course the students will learn the designof microprocessors/microcontrollers-based systems.

Learning Outcomes:

Knowledge:

Once the student has successfully completed this course, he/she will be able to answer the followingquestions or perform following activities:

1. Students will be able to understand components of the computers, microprocessors and microcontrollers.
2. Students will be able to use 8085, 8086 and 8051 addressing modes, registers and instruction sets and writing program in assembly.
3. Students will be able to debug their assembly language programs.
4. Students will be able to program parallel input/output ports of 8085.
5. Students will be able to design memory systems, design memory system layout and analyse timing and electrical compatibility of the memory units.
6. Students will be able to use vector interrupt and understand interrupt process.

Application:

1. To develop and implement various microprocessor based system,
2. To develop, implement, and demonstrate the various processor,
3. To design the 8051-based real time circuit,

Course Contents:

Module 1:

Overview of microcomputer systems and their building blocks, memoryinterfacing, concepts ofinterrupts and Direct Memory Access, instruction sets of microprocessors (with examples of 8085and 8086);

Module 2:

Interfacing with peripherals - timer, serial I/O, parallel I/O, A/D and D/Aconverters;ArithmeticCoprocessors; System level interfacing design;

Module 3:

Concepts of virtual memory, Cache memory, Advanced coprocessorArchitectures- 286, 486,Pentium; Microcontrollers: 8051 systems,

Module 4:

Introduction to RISC processors; ARM microcontrollers interface designs

Text Books

1. MICROPROCESSOR architecture, programming and Application with 8085 - R.Gaonkar (Penram international Publishing LTD.)
2. Microcontrollers:Principles&Applications - Ajit Pal, PHI 2011.
3. The8051 microcontroller and Embeddedsystems- Mazidi,MazidiandMcKinley(PEARSON)
4. 8086 Microprocessor –K Ayala (Cengage learning)

References

1. The 8085 Microprocessor, Architecture, Programming and Interfacing- K Uday Kumar, B.S Umashankar (Pearson)
2. The X-86 PC Assembly language, Design and Interfacing - Mazidi, Mazidi and Causey (PEARSON)
3. The 8051 microcontrollers – Uma Rao and AndhePallavi (PEARSON).

Fifth Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1	CC	ECC509	Electromagnetic Waves	3	0	2	4
2	CC	ECC510	Digital Signal Processing	3	0	2	4
3	DE	ECD--	Discipline Specific Elective	-	-	-	4
4	DE	ECD---	Discipline Specific Elective	-	-	-	3
5	GE	------	Generic Elective	-	-	-	4
6	MC	MC001	Environmental Science	0	0	0	0
7	NPT	NPT501	(NPTEL)	-	-	-	1
8	GS	GSC505	ESP & SDP - V	0	2	0	2
9	INT	INT501	Internship /Industrial Training	0	0	6	3
			Total Credits				25

NPTEL courses are based on the respective year's offered course

Suggestive Choice Based Subjects

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1	GE	CSC502	Data Structure & Algorithms using Python	3	0	2	4
2	DE	ECD504	Fiber Optic Communication	3	0	0	3
3	DE	ECD505	Computer Architecture	3	0	2	4

ELECTROMAGNETIC WAVES

ECC509

L-T-P= 3-0-2

Introduction:
This course introduces students to handling electromagnetic theory using vector calculus. This enablesstudents to handle problems that are more complicated than they are used to from their school days. Dueto general nature of the mathematics they learn in this course, what they learn here will help them in theirfuture courses like fluid dynamics that use similar mathematics:

- Coulomb's law Divergence of electric field Gauss' law Curl of electric field Stokes' theoremElectrostatic potential
- Laplace's equation for electrostatic potential Laplace's equation in other fields Uniqueness ofsolution of Laplace's equation Poisson equation and uniqueness of its solution Method of imagesfor planar surfaces Work and energy in electrostatics
- Conductors and capacitors Reciprocity theorem Polarization and bound charges Lineardielectrics Electric displacement Fields in dielectrics
- Magnetic field due to a magnet Magnetic field due to a steady current Divergence and curl ofmagnetic field Ampere's law The vector potential Magnetization and bound currents
- Magnetic fields in matter Magnetic field in matter Faraday's law Induced electric field Energy inmagnetic field Displacement current
- Maxwell's equations Work done by electromagnetic field Poynting's theorem Momentum inelectromagnetic field Angular momentum in electromagnetic field Electromagnetic waves: thewave equation
- Wave equation Plane electromagnetic waves Energy carried by electromagnetic waves Pressuredue to electromagnetic waves Reflection and transmission of electromagnetic waves Reflectionand transmission of electromagnetic waves
- Review and Problem Solving

Learning Outcomes:

Knowledge:

1. Have an understanding of Maxwell's equations and be able to manipulate and apply them to EMproblems.
2. Formulate and analyze problems involving lossy media with planar boundaries using uniformplane waves.
3. Able to derive and apply the steady state transmission line equations to the design of simpledistributed circuit components.
4. Analyze and design basic microwave circuits using microwave network parameters.
5. For simple antennas derive fundamental antenna parameters starting from Maxwell's equationsand be able to use these in the design of rudimentary wireless communications systems.

Application:

1. Every part of the electromagnetic spectrum has multiple applications in our everyday lives, and manyof those applications involve technology.

2. Radio waves are used for communications - that's why the thing in your car is called a radio. Butthey're not just for FM and AM radio. They're also used to broadcast television signals, and they're howmobile phones work - your voice is sent through radio signals. Radio waves are also used for radar, whichis why both words start with the same three letters. Radar is extremely important in military operationsand can also be used in speed cameras and speed guns.
3. Microwaves have probably the most obvious application: in a microwave. Microwaves can be used toheat and cook your food. Since microwaves aren't that different from radio waves, they've also been usedfor communications, especially for extending TV signals to larger distances.
4. Infrared waves are what come out of remote controls. Infrared is also a type of wave that transmits a lotof heat. When you put your hand near to, but not touching, something and it feels warm, it's because ofinfrared waves coming out of it. All hot objects produce infrared. In fact, you're producing infrared waves
right now. Infrared waves can also be used to create heat-sensitive and night vision cameras.
6.X-rays are electromagnetic waves that can be used in aptly named x-ray machines to see inside yourbody and diagnose various diseases. They can also be used to kill cancer cells.

Course Contents:

Module 1:
Transmission Lines- Equations of Voltage and Current on TX line, Propagationconstant andcharacteristic impedance, and reflection coefficient and VSWR, Impedance Transformation on Loss less and Low loss Transmission line, Power transfer on TX line, Smith Chart, Admittance SmithChart, Applications of transmission lines: Impedance Matching, use transmission line sections ascircuit elements.
Module 2:
Maxwell's Equations- Basics of Vectors, Vector calculus, Basic laws ofElectromagnetics, Maxwell'sEquations, Boundary conditions at Media Interface
Module 3:
Uniform Plane Wave- Uniform plane wave, Propagation of wave, Wavepolarization, Poincare'sSphere, Wave propagation in conducting medium, phase and group velocity, Power flow andPoynting vector, Surface current and power loss in a conductor.
Module 4:
Plane Waves at a Media Interface- Plane wave in arbitrary direction, Reflection and refraction atdielectric interface, Total internal reflection, wave polarization at media interface, Reflection from aconducting boundary.
Module 5:
Wave propagation in parallel planewaveguide, Analysis of waveguide general approach, Rectangularwaveguide, Modal propagation in rectangular waveguide, Surface currents on the waveguide walls,Field visualization, Attenuation in waveguide**.**
Module 6:
Radiation: Solution for potential function, Radiation from the Hertz dipole, Powerradiated by hertzdipole, Radiation Parameters of antenna, receiving antenna, Monopole and Dipole antenna,

Text Books
1.Principles of Electromagnetics,4th Edition, Matthew O H Sadiku, Oxford University Press.
2.Electromagnetic Field Theory & Transmission Lines, G. S. N. Raju, Pearson Education
3.Electromagnetic Waves Shev gaonkar, Tata-McGaw-Hill r –RK
Reference Books
1. Engineering Electromagnetics, 2ed Edition - Nathan Ida, Springer India
2. Fields &Waves in Communication Electronics, S.Ramo, J. R. Whinnery& T. VanDuzer, John Wiley

3. Electromagnetic Theory & Applications, A.K. Saxena, Narosa Publishing House Pvt. Ltd.
4. Electromagnetics, 2ed Edition –JA Edminister, Tata-McGraw-Hill. Engineering Electromagnetics, 7th Edition-W.H.Hayt&J.A.Buck, Tata-McGraw-Hill

DIGITAL SIGNAL PROCESSING

ECC510

L-T-P= 3-0-2

Introduction:
Digital Signal Processors (DSP) take real-world signals like voice, audio, video, temperature,pressure, or position that has been digitized and then mathematically manipulates them. A DSP isdesigned for performing mathematical functions like "add", "subtract", "multiply" and "divide" veryquickly.Signals need to be processed so that the information that they contain can be displayed, analyzed, orconverted to another type of signal that may be of use. In the real-world, analog products detectsignals such as sound, light, temperature or pressure and manipulate them. Converters such as anAnalog-to-Digital converter then take the real-world signal and turn it into the digital format of 1'sand 0's. From here, the DSP takes over by capturing the digitized information and processing it. Itthen feeds the digitized information back for use in the real world. It does this in one of two ways,either digitally or in an analog format by going through a Digital-to-Analog converter. All of thisoccurs at very high speeds.

Objectives:

This course covers the techniques of modern digital signal processing that are fundamental to a widevariety of application areas. Special emphasis is placed on the architectures and design techniquesfor digital filters.

Learning Outcomes:
Design and implement digital filters by hand and by using Matlab. Use computers and MATLAB tocreate, analyze and process signals, and to simulate and analyze systems sound and image synthesisand analysis, to plot and interpret magnitude and phase of LTI system frequency responses.

Application :

1. Filtering.
2. Speech synthesis in which white noise (all frequency components present to the same level) isfiltered on a selective frequency basis in order to get an audio signal.
3. Speech compression and expansion for use in radio voice communication.
4. Speech recognition.
5. Signal analysis.
6. Image processing: filtering, edge effects, enhancement.
7. PCM used in telephone communication.
8. High speed MODEM data communication using pulse modulation systems such as FSK, QAMetc. MODEM transmits high speed (1200-19200 bits per second) over a band limited (3-4 KHz)analog telephone wire line.
9. Wave form generation.

Course Contents:

Module 1:
Discrete time signals: Sequences; representation of signals on orthogonal basis; Samplingandreconstruction of signals; Discrete systems attributes, Z-Transform, Analysis of LSI systems,frequencyAnalysis, Inverse Systems, Discrete Fourier Transform (DFT),Fast Fourier TransformAlgorithm, Implementation of Discrete Time Systems

Module 2:
Designof FIR Digital filters: Windowmethod,Park-McClellan's method.Design of IIR Digital Filters:Butterworth, Chebyshev and Elliptic Approximations;Lowpass, Bandpass, Bandstop and High passfilters.

Module 3:
Designof FIR Digital filters: Windowmethod,Park-McClellan's method. Design of IIR Digital Filters:Butterworth, Chebyshev and Elliptic Approximations;Lowpass, Bandpass, Bandstop and High passfilters.

Module 4:
Effect of finite register length in FIR filter design. Parametric and non-parametric spectral estimation.Introduction to multirate signalprocessing.Application of DSP.

Text Books

1. Digital Signal Processing – Principles, Algorithms and Applications, J.G.Proakis&D.G.Manolakis, Pearson Ed.
2. Digital Signal processing – A Computer Based Approach, S.K.Mitra, TMH Publishing Co.
3. Digital Signal Processing Signals, Systems and Filters, A. Antoniou, TMH Publishing Co.
4. VLSI Digital Signal Processing Systems Design and Implementation, Wiley International Publication.
5. Digital Signal Processing with Field Programmable Gate Arrays, U.Meyer-Baese, Springer.

Reference Books:

1. Digital Signal Processing, P. Rameshbabu, Scitech Publications (India).
2. Digital Signal Processing, S.Salivahanan, A.Vallabraj& C. Gnanapriya, TMH Publishing Co.

ENVIRONMENTAL SCIENCE

MC001

L-T-P= 0-0-0

Objectives:

The importance of Environmental Studies cannot be disputed. The need for sustainable development is a key to the future of mankind. The degradation of our environment is linked to continuing problems of pollution, loss of forest, solid waste disposal, issues related to economic productivity and national as well as ecological security. The increasing levels of global warming, the depletion of the ozone layer and a serious loss of biodiversity have also made everyone aware of growing environmental concerns. The United Nations Conference on Environment and Development held in Rio De Janero in 1992, and the World Summit on Sustainable

Development at Zoharbex in 2002 have drawn the attention of people around the globe to the developing condition of our environment. It is clear that no citizen of the earth can afford to be ignorant of environmental issues. Environmental management has become a part of the health care sector. Managing environmental hazards and preventing possible disasters has become an urgent need. Human beings have been interested in ecology since the beginning of civilization. Even our ancient scriptures have included practices and values related with environmental conservation. It is now even more critical than ever before for mankind as a whole to have a clear understanding of environmental concerns and to follow sustainable development practices.

Course Outcomes (CO):

In spite of the developing status of the environment, the formal study of environment has so far not received adequate attention in our academic performances.

Course Contents:

Module 1:
Introduction, Ecology, Air pollution and control
Module 2:
Water Pollution and Control
Module 3:
Land Pollution, Noise Pollution.
Module 4:
Environmental Management

Text Books

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380013, India, Email:mapin@icenet.net (R)
3. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p4. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
4. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001,
5. Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
6. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
7. Down to Earth, Centre for Science and Environment (R)
8. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
9. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
10. Heywood, V.H &Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.

FIBER OPTIC COMMUNICATION

ECD510

L-T-P= 3-0-0

Introduction:

This course aims to initiate and expose the students to exciting area of optical communication. Technical concepts which are at the core of design, implementation and research will be discussed during this course in order that is conductive to understanding general concepts as well as latest development. Following points will be elaborated in this course:

- Optical fibers
- Optical Transmitter
- Optical Receiver
- Optical Link
- Optical networks

Objectives:

The objective of the course is to provide a comprehensive understanding of optical communication systems and networks. The course starts with basics of light waves and their propagation, and single/multimode optical fibers. Then move to broadband (light emitting diode) and narrowband (laser diodes) optical sources and their modulation; PIN and Avalanche photo detectors and other elements of optical systems. We will study basic optical networks then using a design approach to point-to-point fiber links, star, bus and ring topologies. Multiple access techniques such as WDM (Wavelength Division Multiplexing) and SCM (Sub Carrier Multiplexing) also will be covered. Synchronous Optical Networks (SONET) will be covered to good extend. Passive Optical Networks (PON) widely used in fiber-to-the home (FTTH) schemes and emerging radio over fiber (ROF) networks that bridge the optical and wireless networks will also be covered.

Learning Outcomes:

Knowledge:

1. To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.
2. To understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors. Design optimization of SM fibers, RI profile and cut-off wave length.
3. To learn the various optical source materials, LED structures, quantum efficiency, Laser diodes and different fiber amplifiers.
4. To learn the fiber optical receivers such as PIN APD diodes, noise performance in photo detector, receiver operation and configuration.
5. To learn fiber slicing and connectors, noise effects on system performance, operational principles WDM and solutions.

Course Contents:

Module 1:

Introduction to vector nature of light, propagation of light, propagation of light ina cylindricaldielectric rod, Ray model, wave model.

Module 2:

Different types of optical fibers, Modal analysis of a step index fiber.Signaldegradation on optical fiber due to dispersion and attenuation. Fabrication of fibers andmeasurement techniques like OTDR.

Module 3:

Optical sources - LEDs and Lasers, Photo-detectors - pin-diodes, APDs, detectorresponsivity, noise,optical receivers. Optical link design - BER calculation, quantum limit, power penalties.

Module 4:

Optical switches - coupled mode analysis of directional couplers, electro-opticswitches**.**

Module 5:

Optical amplifiers - EDFA, Raman amplifier.

Module 6:

WDM and DWDM systems. Principles of WDM networks**.**

Module 7:

Nonlinear effects in fiber optic links. Concept of self-phase modulation, groupvelocity dispersionand solition based communication.

Text Books

1. Optical Fibre Communication: John M. Senior (Pearson).
2. Optical Fibre Communication : Gerd Kaiser (TMH).

References

1. Optical Networks–A practical perspective:RajivRamaswami, K.N.Sivarajan,Galen H.Sasaki Morgan-Kaufman).
2. Optical Communication Systems : John Gawar (PHI).

Sixth Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1	CC	ECC611	Control Systems	3	1	2	5
2	DE	ECD---	Discipline Specific Elective	-	-	-	5
3	DE	ECD---	Discipline Specific Elective	-	-	-	4
4	GE	------	Generic Elective	-	-	-	4.5
5	MC	MC004	Disaster management	0	0	0	0
6	HSM	HSM---	Humanities	-	-	-	3
7	GS	GSC606	ESP & SDP - VI	0	2	0	2
8	NPT	NPT601	(NPTEL)	-	-	-	1
9	PTI	ECPT01	Mini Project/Electronics Design Workshop	0	0	4	2
			Total credits				26.5

NPTEL courses are based on the respective year's offered course

Students will undergo project/training/internship in the industry / research organization / reputed Institute during the vacation

Suggestive Choice Based Subjects

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1	GE	CSC608	Database Management System	3	0	3	4.5
2	DE	ECD607	Antennas and Propagation	3	0	2	4
3	DE	ECD627	Computer Network	3	0	4	5
4	HSM	HSM002	Values and Ethics	3	0	0	3

CONTROL SYSTEMS

ECC611

L-T-P= 3-1-2

Introduction:

This course examines control system analysis and design concepts in classical and modern state space methods. The Topics to be covered (tentatively) include:

- Fundamentals of control system
- Transfer function representation
- Time response analysis
- Stability analysis in S-domain
- Frequency response analysis
- Stability analysis in frequency domain
- Classical control design techniques
- State space analysis of continuous systems

Objectives:

The Course Educational Objectives are:

1. In recent years, control systems have assumed an increasingly important role in the development and advancement of modern civilization and technology. Practically every aspect of our day-today activities is affected by some type of control systems.
2. Control systems are found in abundance in all sectors of industry, such as equality control of manufactured products, automatic assembly line, machine-tool control, space technology and weapon systems, computer control, transportation systems, power systems, robotics, Micro- Electro-Mechanical systems (MEMS), nano-technology and many others.
3. In this subject it is aimed to introduce to the students the principles and application of control systems in everyday life. The basic concepts of block diagram reduction, time domain analysis solutions to time invariant systems and also deals with the different aspects of stability analysis of systems infrequency domain and time domain.
4. Simulation exercises are included in Matlab tool and Simulink tool throughout for practice.

Learning Outcomes:

Knowledge:

Once the student has successfully completed this course, he/she will be able to answer the following questions or perform following activities:

1. Able to understand the basic concepts of linear control system.
2. Able to describe different stability analysis of the system.
3. Able to analyze the classical control design technique.
4. Able to understand the modern state space analysis.

Applications:

1. To develop, implement, and analyze all stability checking methods.
2. To develop and implement different controllers.

3. To develop classical and modern control system approaches.

Course Contents:

Module 1:
Introduction to control problem- Industrial Control examples. Transfer function. System with dead- time. System response. Control hardware and their models: potentiometers, synchro, LVDT, dc and ac servomotors, tacho-generators, electro hydraulic valves, hydraulic servomotors, electro pneumatic valves, pneumatic actuators. Closed-loop systems. Block diagram and signal flow graph analysis.
Module 2:
Feedback control systems- Stability, steady-state accuracy,transient accuracy, disturbance rejection, insensitivity and robustness. proportional, integral and derivative systems. Feed-forward and multi- loop control configurations, stability concept, relative stability, Routh stability criterion.
Module 3:
Time response of second-order systems, steady-state errors and error constants. Performance specifications in time-domain. Root locus method of design. Lead and lag compensation.
Module 4:
Frequency-response analysis- Polar plots, Bode plot, stability in frequency domain, Nyquist plots. Nyquist stability criterion. Performance specifications in frequency-domain. Frequency-domain methods of design, Compensation & their realization in time & frequency domain. Lead and Lag compensation. Op-amp based and digital implementation of compensators. Tuning of process controllers. State variable formulation and solution.

Text Books

1. Linear Control Systems with MATLAB Applications (11th edition), by B S Manke, KhannaPublishers. (Unit-1 to Unit-8)

References

1. Control Systems Engineering (2nd edition), by I. J. Nagrath and M. Gopal, New Age International (P)Ltd.
2. Modern Control Engineering (3rd edition), by Katsuhiko Ogata, Prentice Hall ofIndiaPvt.Ltd.

DISASTER MANAGEMENT

MC004

L-T-P= 0-0-0

Introduction:

Disasters are seen as the effect of hazards on vulnerable areas. Hazards that occur in areas with low vulnerability do not result in a disaster. Great damage, loss, destruction and devastation to life and property are the results of Disasters. The immeasurable damage caused by disaster varies with the geographical location. In the concerned areas disasters have the following effects: It

completely upsets the normal day to day life. Harmfully persuade the emergency systems depending on the intensity and severity of the disaster the normal needs and processes are badly affected and deteriorated. Disasters are the effect of hazard on vulnerable or defenceless areas. Hazards that occur in areas with low vulnerability do not result in a disaster.

Course Objectives:

Students will be able to:

1. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countriesthey work in.

Course Outcomes:

1. Develop an understanding of the key concepts, definitions a key perspective of all Hazards Emergency Management
2. Understand the Emergency/Disaster Management Cycle REVISED
3. Have a basic understanding for the history of Emergency management
4. Develop a basic under understanding of Prevention, Mitigation, Preparedness, Response and Recovery
5. Develop a basic understanding for the role of public and private partnerships

Course Contents:

Module 1:

Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity – Disaster and Development, and disaster management

Module 2:

Geological Disasters (earthquakes, landslides, tsunami, mining); Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves) Biological Disasters (epidemics, pest attacks, forest fire); Technological Disasters (chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters) Global Disaster Trends – Emerging Risks of Disasters – Climate Change and Urban Disasters.

Module 3:

Disaster Management Cycle – Paradigm Shift in Disaster Management Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Micro zonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness During Disaster – Evacuation – Disaster Communication – Search and Rescue – Emergency Operation Centre – Incident Command System – Relief and Rehabilitation – Post-disaster – Damage and Needs Assessment, Restoration of

Critical Infrastructure – Early Recovery – Reconstruction and Redevelopment; IDNDR,Yokohama Strategy, Hyogo Framework of Action.

Module 4:

Disaster Profile of India – Mega Disasters of India and Lessons Learnt Disaster Management Act 2005 – Institutional and Financial Mechanism National Policy on Disaster Management, National Guidelines and Plans on Disaster Management;Role of Government (local, state and national), Non-Government and Inter- Governmental Agencies.

Module 5:

Geo-informatics in Disaster Management (RS, GIS, GPS and RS), Disaster Communication System (Early Warning and Its Dissemination), Land Use Planning and Development Regulations, Disaster Safe Designs and ConstructionsStructural and Non-Structural Mitigation of Disasters, S&T Institutions for Disaster Management in India.

Module 6:

Study of Recent Disasters (at local, state and national level), And Preparation of Disaster Risk management Plan of an Area or Sector, Role of Engineers in Disaster Management.

Suggested reading

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies" New Royal book Company.
2. Sahni, PardeepEt.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.
3. Goel S. L., Disaster Administration And Management Text And Case Studies", Deep & Deep Publication Pvt. Ltd., New Delhi.

ANTENNAS AND PROPAGATION

ECD606

L-T-P= 3-0-2

Introduction:

The Topics to be covered (tentatively) include:

1. Antennas

- Overview of Transmission line parameters related to antenna design and performance.
- Wave-guides and cavities.
- Antenna fundamentals: (Types of antennas, Radiation mechanism). Overview of Plane and Solid angles, Near-field, Far-field regions, Polarization, Radiation Pattern, Performance Antenna Parameters (Radiated Power, Directivity, Gain, Efficiency, Radiation Resistance and Input Impedance). Dipole, Monopole antennas, Loop antennas.
- Broadband Antennas, Helical, Yagi-Uda, Log-periodic antennas.
- Overview of Aperture antennas-Horn and dish reflector antennas.
- Microstrip antennas, Rectangular, circular Microstrip patch antennas.

2. Terrestrial Propagation

- Basic propagation modes, free space, ground reflection and diffraction. Ground wave propagation. Sky wave propagation.
- Atmospheric effects on radio wave propagation.

- Space (terrestrial) wave propagation.
- Propagation models in mobile radio systems. Statistical models.
- Basic diversity and Fading.

Objectives:

In this course we will study the basic components of Wave-guides and cavities; Radiation and antennas; Antenna parameters; dipoles and loop antennas; traveling wave antennas; Aperture and patch antennas; Linear and planar antenna arrays; Basic propagation modes; Free-space propagation; Ground wave propagation; Sky wave propagation; Space (terrestrial) wave propagation; Introduction to Propagation models in mobile radio systems

- To review the fundamentals of antenna theory.
- To expose students to examples of applications and various antenna types including linear and planar microstrip configuration.
- Introduce students to the various types and models of Radio wave propagation affecting Communication Systems. Introduction to Diversity principles.
- To improve the design and problem solving skills

Learning Outcomes:

Knowledge:

- Understand the function of antennas Understand the different types of antennas and the radiation mechanism.
- Evaluate the fundamental parameters of antennas and arrays operating at various frequencies from LF to Microwave applications.
- Ability to design various types of linear and planar antennas.
- Identify the atmospheric and terrestrial effects on radio wave propagation.
- Evaluate basic propagation models in mobile radio systems.

Application:

1. To develop and implement different antennas with help of different calculation, plotting and visualizing radiation patterns and various antenna parameters.
2. Students are introduced to the design of practical antenna systems used for communications, radar and other applications.
3. Students learn and analyze design issues and the necessary trade-offs that are required in complex systems with antenna design as a significant aspect of the overall system design and development

Course Contents:

Module 1:

Fundamental Concepts- Physical concept of radiation, Radiation pattern, near-andfar-field regions,reciprocity, directivity and gain, effective aperture, polarization, input impedance, efficiency, Friistransmission equation, radiation integrals and auxiliary potential functions.

Module 2:

Radiation from Wires and Loops- Infinitesimal dipole, finite-length dipole, linearelements nearconductors, dipoles for mobile communication, small circular loop.

Module 3:

Aperture and Reflector Antennas-Huygens' principle, radiation from rectangularand circularapertures, design considerations, Babinet's principle, Radiation from sectoral and pyramidal horns,design concepts, prime-focus parabolic reflector and cassegrain antennas

Module 4:

Broadband Antennas- Log-periodic and Yagi-Uda antennas, frequencyindependent antennas, broadcast antennas.

Module 5:

Micro strip Antennas- Basic characteristics of micro strip antennas, feedingmethods, methods ofanalysis, design of rectangular and circular patch antennas.

Module 6:

Antenna Arrays-Analysis of uniformly spaced arrays with uniform and non-uniform excitationamplitudes, extension to planar arrays, synthesis of antenna arrays using Schelkunoff polynomialmethod, Woodward-Lawson method.

Module 7:

Basic Concepts of Smart Antennas-Concept and benefits of smart antennas, fixedweight beamforming basics, Adaptive beam forming.

Module 8:

Different modes of Radio Wave propagation used in current practice.

Text Books

1. Antenna(for all application),JohnD. Kraus and Ronald J. Marhcfka;Tata-MacGrawHill,3rdEdition
2. Antenna &Wave Propagation, K.D Prasad;SatyaPrakashan,NewDelhi, 3rdEdition
3. Antenna Theory:Analysis& Design, ConstantineA. Balanis; Willey, 3rdEdition

References

1. Elements of Electromagnetics; Mathew N. O. Sadiku, Oxford University Press, 5th Edition (2010)
2. Electromagnetic Waves & Radiating Systems, E . C Jordan & K.G. Balmain, Pearson Education, 2nd Edition(2009)
4. Microstrip Antenna Design Handbook- Ramesh Garg; Artech House (2001)

VALUES AND ETHICS

HSM002

L-T-P= 3-0-0

Introduction:

This course teaches students the basic principles of Values and Ethics within profession. These deals mainly with

- Values in professional life
- Ethics in professional life
- Resources depletion
- Conservation of resources for future generations
- Technology transfer
- Eco friendly Technology
- Value crisis in society
- Present society without values and Ethics.

Course Objectives:

This course relates to the present world and teaches students the need and importance of values and the problems faced by the present society in terms of depletion of natural resources and how to control the same for the sake of future generations.

Course Outcomes (CO):

1. Understand the present scenario of degradation of values and Ethics system
2. Depletion of resources and how to conserve them.
3. Club of Rome and what all stalwarts have thought to improve the situation
4. Sustainable Development.
5. Value spectrum of a good life
6. Present societal changes in terms of values and ethics
7. What steps to be taken to improve value system?
8. How to avoid conflicts to have a peaceful job life.

Course Contents:

Module 1:
Rapid Technological growth and depletion of resources, Reports of the Club of Rome. Limits ofgrowth: Sustainable development Energy Crisis: Renewable Energy Resources Environmental degradation and pollution. co-friendly Technologies. Environmental Regulations, Environmental Ethics Appropriate Technology Movement of Schumacher; later developments Technology and developing notions. Problems of Technology transfer, Technology assessment impact analysis. Human Operator in Engineering projects and industries. Problems of man, machine, interaction, Impact of assembly line and automation. Human centred Technology.

Module 2:
Engineering profession: Ethical issues in Engineering practice, Conflicts between businessdemands and professional ideals. Social and ethical responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond.

Module 3:
Values Crisis in contemporary society Nature of values: Value Spectrum Of good life Psychological values: Integrated personality; mental health Societal values: The modern search for a good society, justice, democracy, secularism, rule of law, values in Indian Constitution. Aesthetic values: Perception and enjoyment of beauty, simplicity, clarity Moral and ethical values: Nature of moral judgments; canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility.

Books:

1. AN Tripathi, Human values in the Engineering Profession, Monograph published byIIM, Calcutta1996

Seventh Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1	DE	ECD---	Discipline Specific Elective	-	-	-	3
2	DE	ECD---	Discipline Specific Elective	-	-	-	3
3	DE	ECD---	Discipline Specific Elective	-	-	-	3
4	GE	------	Generic Elective	-	-	-	4
5	GS	GSC707	ESP & SDP - VII	0	1	0	1
6	BSC	HSM---	Humanities	-	-	-	3
7	INT	INT701	Internship/ Industrial Training	0	0	8	4
					Total credits		21

NPTEL courses are based on the respective year's offered course

Students will undergo project/training/internship in the industry / research organization / reputed Institute during the vacation

Suggestive Choice Based Subjects

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1	DE	ECD714	Embedded System	3	0	0	3
2	DE	ECD715	Microwave Theory and Techniques	3	0	0	3
3	GE	CSD806	Digital Image and Video Processing	3	0	2	4
4	DE	ECD711	Mobile Communication	3	0	0	3
5	HSM	HSM011	Human Resource Management	3	0	0	3

EMBEDDED SYSTEMS

ECD713

L-T-P= 3-0-0

Introduction

This course is primarily intended for students interested in learning how embedded software is to be designed efficiently and correctly. A student taking this course will be introduced to embedded systems, fundamentals of hardware design and architecture, different architectures for embedded software, the tools to get you started on embedded software design, the typical pitfalls of embedded software design and how to avoid them, real-time and embedded operating systems, how embedded software is to be designed in an RTOS-based system, and how embedded software is to be debugged.

Learning Outcomes:

Knowledge:

Although the students are engaged with a fun and rewarding lab experience, the educational pedagogy is centered on fundamental learning objectives. After the successful conclusion of this class, students should be able to understand the basic components of a computer, write C language programs that perform I/O functions and implement simple data structures, manipulate numbers in multiple formats, and understand how software uses global memory to store permanent information and the stack to store temporary information. Our goal is for students to learn these concepts:

1. Understanding how the computer stores and manipulates data,
2. The understanding of embedded systems using modular design and abstraction,
3. C programming: considering both function and style,
4. The strategic use of memory,
5. Debugging and verification using a simulator and on the real microcontroller
6. How input/output using switches, LEDs, DACs, ADCs, motors, and serial ports,
7. The implementation of an I/O driver, multithreaded programming,
8. Understanding how local variables and parameters work,
9. Analog to digital conversion (ADC), periodic sampling,
10. Simple motors (e.g., open and closed-loop stepper motor control),
11. Digital to analog conversion (DAC), used to make simple sounds,
12. Design and implementation of elementary data structures.

Course Content:

Module 1:

The concept of embedded systems design, Embedded microcontroller cores, embedded memories.

Module 2:

Examples of embedded systems, Technological aspects of embedded systems: interfacing between analog and digital blocks, signal conditioning, digital signal processing.

Module 3:

Sub-system interfacing, interfacing with external systems, user interfacing.

Module 4:

Design tradeoffs due to process compatibility,thermal considerations, etc., Software aspects of embedded systems: real time programming languages and operating systems for embedded systems.

TextBooks

1. EmbeddedSystems: Rajkamal(TMH)

ReferenceBooks

1. Introduction to Embedded Systems: ShibuK.V.(TMH)
2. Embedded System Design A unified hardware and software introduction: F. Vahid (John Wiley)
3. Embedded Systems:L.B.Das(Pearson)
4. Embedded System design:S. Heath(Elsevier)
5. Embedded microcontroller and processor design: G.Osborn (Pearson)

MICROWAVE THEORY AND TECHNIQUES

ECD715

L-T-P= 3-0-0

Introduction:

This course examines basic properties of Microwave, Microwave Waveguides, and SemiconductorMicrowave Devices. The Topics to be covered (tentatively) include:

- Graduate will be able to understand the basic properties of Microwave.
- Graduate will be able to understand Microwave Waveguides
- Graduate will acquire knowledge on Waveguide Passive Components
- Graduate will acquire knowledge of Planar structure
- Graduate will get knowledge on Microwave Tubes
- Graduates will be able to understand Semiconductor Microwave Devices

Objectives:

- The course will introduce RF designs and wireless technology, RF modulation and testing(Bloom Taxonomy level 2)
- This course presents the theory and practice of Microwave Engineering including Antenna(Bloom Taxonomy level 2)
- VSWR methods and the application of this to the design of modern communication systems.(Bloom Taxonomy level 2)
- Simulation exercises are included in Matlab and Simulink throughout for practice (BloomTaxonomy level 3)

Learning Outcomes:

Knowledge:

Once the student has successfully completed this course, he/she will be able to answer thefollowing questions or perform following activities:

1. Able to Understand the basic concepts of Radio frequency and Microwave systems
2. Able to describe Analyse RF designs in particular for power efficiency, modulation etc.
3. Able to Analyze the RF testing techniques to RF designs.
4. Able to Analyzebehavior of BJT and MOSFETs at RF frequencies.

Application:

1. Microwave technology for medical science (diagonostic application, Theraputic application etc.)
2. To develop, Point-to-point communication, Satellite, Cellular access technologies, Radartechnology.
3. Car avoidance radar, Traffic surveillance, Air traffic security "cameras"
4. Heating & detection of foreign bodies in food New and novel application areas are constantly beingadded

Course Contents:

Module 1:

Introduction to Microwaves-History of Microwaves, Microwave Frequency bands;Applications ofMicrowaves: Civil and Military, Medical, EMI/ EMC.

Module 2:

Mathematical Model of Microwave Transmission-Concept of Mode, Features ofTEM, TE and TMModes, Losses associated with microwave transmission, Concept of Impedance in Microwavetransmission.

Module 3:

Analysis of RF and Microwave Transmission Lines- Coaxial line, Rectangularwaveguide, Circularwaveguide, Strip line, Micro strip line.

Module 4:

Microwave Network Analysis- Equivalent voltages and currents for non-TEMlines, Network parameters for microwave circuits, Scattering Parameters.

Module 5:

Passive and Active Microwave Devices- Microwave passive components:Directional Coupler, PowerDivider, Magic Tee, Attenuator, Resonator. Microwave active components: Diodes, Transistors,Oscillators, Mixers. Microwave Semiconductor Devices: Gunn Diodes, IMPATT diodes, SchottkyBarrier diodes, PIN diodes. Microwave Tubes: Klystron, TWT, Magnetron.

Module 6:

Microwave Design Principles-Impedance transformation, Impedance Matching, Microwave FilterDesign, RF and Microwave Amplifier Design, Microwave Power Amplifier Design, Low NoiseAmplifier Design, Microwave Mixer Design, Microwave Oscillator Design. Microwave Antennas-Antenna parameters, Antenna for ground-based systems, Antennas for airborne and satellite bornesystems, Planar Antennas.

Module 7:

Microwave Measurements- Power, Frequency and impedance measurement atmicrowave frequency,Network Analyzer and measurement of scattering parameters, Spectrum Analyzer and measurement ofspectrum of a microwave signal, Noise at microwave frequency and measurement of noise figure.Measurement of Microwave antenna parameters.

Module 8:

Microwave Systems- Radar, Terrestrial and Satellite Communication, Radio Aids to Navigation, RFID,GPS. Modern Trends in Microwaves Engineering- Effect of Microwaves on human body, Medical

andCivil applications of microwaves, Electromagnetic interference and Electromagnetic Compatibility (EMI& EMC), Monolithic Microwave ICs, RFMEMS for microwave components, Microwave Imaging.

Text Books

1. Robert E Collin Foundation of Microwave Engineering, 2ed edition, McGraw Hill, Inc.
2. S Das & A Das Microwave Engineering Tata-McGraw Hill
3. MicrowaveEngineering,3Rd Ed David M. Pozar, Willey & Sons Inc

References

1. ML Sisodia& GS Raghuvansi Microwave Circuits and Passive Devices, New Age
2. Microwave Engineering, Manojit Mitra, Dhanpatrai& Co

DIGITAL IMAGE AND VIDEO PROCESSING

COURSE CODE: CSD806

L-T-P= 3-0-2

Introduction:

This course is an introduction to the fundamental concepts and techniques in basic digital imageprocessing and their applications to solve real life problems. The topics covered include Digital ImageFundamentals, Image Transforms, Image Enhancement, Restoration and Compression, MorphologicalImage Processing, Nonlinear Image Processing, and Image Analysis. Application examples are alsoincluded.Upon completion of this course, students will be familiar with basic image processingtechniques for solving real problems. Student will also have sufficient expertise in both the theory of two-dimensional signal processing and its wide range of applications, for example, image restoration, imagecompression, and image analysis.

Objectives:

The course objectives include: overview of digital image processing field; understand the fundamentalDIP algorithms and implementation; gain experience in apply in image processing algorithms to realproblems.
Major Learning Objectives are:

1. Develop a theoretical foundation of fundamental Digital Image Processing concepts.
2. Provide mathematical foundations for digital manipulation of images; image acquisition; pre-processing; segmentation; Fourier domain processing; and compression.
3. Gain experience and practical techniques to write programs for digital manipulation of images; imageacquisition; pre-processing; segmentation; Fourier domain processing; and compression.
4. Describe and explain basic principles of digital image processing;
5. Design and implement algorithms that perform basic image processing (e.g., noise removal and imageenhancement).
6. Design and implement algorithms for advanced image analysis (e.g., image compression, imagesegmentation).
7. Assess the performance of image processing algorithms and systems.

Learning Outcomes:

Knowledge:

Students who complete this course will be able to:
1. Analyze general terminology of digital image processing.
2. Examine various types of images, intensity transformations and spatial filtering.
3. Develop Fourier transform for image processing in frequency domain.
4. Evaluate the methodologies for image segmentation, restoration etc.
5. Implement image process and analysis algorithms.
6. Apply image processing algorithms in practical applications.

Application:

Visual information is the most important type of information perceived, processed and interpreted by thehuman brain. One third of the cortical area of the human brain is dedicated to visual informationprocessing. Digital image processing, as a computer-based technology, carries out automatic processing,manipulation and interpretation of such visual information, and it plays an increasingly important role inmany aspects of our daily life, as well as in a wide variety of disciplines and fields in science andtechnology, with applications such as television, photography, robotics, remote sensing, medicaldiagnosis and industrial inspection.
• Computerized photography (e.g., Photoshop)
• Space image processing (e.g., Hubble space telescope images, interplanetary probeimages)
• Medical/Biological image processing (e.g., interpretation of X-ray images, blood/cellularmicroscope images)
• Automatic character recognition (zip code, license plate recognition)
• Finger print/face/iris recognition
• Remote sensing: aerial and satellite image interpretations
• Reconnaissance
• Industrial applications (e.g., product inspection/sorting)

Course Contents:

***Module 1*: Digital Image Processing Systems:**
Introduction to structure of human eye, Image formation in the human eye, Brightness adaptation anddiscrimination, Image sensing and acquisition, storage, Processing, Communication, Display ImageSampling and quantization, Basic relationships between pixels.
***Module 2*: Image Transforms(implementation):** Introduction to Fourier transform, DFT and 2-D DFT,Properties of 2-D DFT, FFT, IFFT, Walsh transform, Hadamard transform, Discrete cosine transform,Slant transform, Optimum transform: Karhunen-Loeve (Hotelling) transform.
***Module 3*: Image Enhancement in the Spatial and Frequency Domain:** Gray level transformations,Histogram processing, Arithmetic and logic operations, Spatial filtering: Introduction, Smoothing andsharpening filters. Frequency domain filters: Homo morphic filtering.
***Module 4*: Image Data Compression:** Fundamentals, Redundancies: Coding, Inter pixelPsycho-visual, fidelity criteria, Image compression models, Error free compression, Lossy compression,Image compression standards: Binary image and Continuous Tone Still Image compression standards,Video compression standards.
***Module 5*: Morphological Image Processing:** Introduction, Dilation, Erosion, Opening, closing, Hit-or miss transformation, Morphological algorithm operations on binary Images, Morphological algorithmoperations on gray-scale Images.
***Module 7*: Image Segmentation, Representation and Description:**

Detection of discontinuities, Edge linking and Boundary detection, Thresholding, Region basedsegmentation, Image Representation schemes, Boundary descriptors and Regional descriptors.

Text Books

1. R.C Gonzalez and R. Woods:-Digital Image Processing, (Indian reprint: Pearson publication, 2001)
2. Anil K. Jain:-Digital Image Processing (Prentice-Hall, India)

References

1. W.K. Pratt:-Digital Image Processing, -2nd Edition, (John Wiley &Sons).
2. B.Chanda&D.Dutta Majumder, Digital Image Processing and Analysis, (Prentice-Hall, India)

MOBILE COMMUNICATION

ECD704

L-T-P= 3-0-0

Introduction:
This course examines operating system design concepts, data structures and algorithms, and systems programming basics. The Topics to be covered (tentatively) include:
• Computer and operating system structures
• Process and thread management
• Process synchronization and communication
• Memory management
• Virtual memory
• File system
• I/O subsystem and device management
• Selected examples in networking, protection and security

Objectives:

In this course, we will study the basics of Cellular Concept, Channel assignment schemes, Handoff, different types of channel characteristics and propagation model, multiple Access Technologies in cellular communication. This course also makes you acquainted with 2G and 3G systems, such as-GSM, GPRS, CDMA, UMTS and introduces with the basics of WLAN technology: IEEE 802.11 standards and protocols, as well as gives an insight on Mobile Internet Protocol.

Learning Outcomes:

Knowledge:

1. Able to explain the basic Cellular concept, different types channel assignment strategies, handoff process and different types of handoff.
2. Able to explain wireless channel and its characteristics
3. Able to explain multiple access techniques used for different generation of wireless cellular communication.

4. Able to explain different generation of cellular communication and their architecture.
5. Able to explain different protocols used for WLAN.

Course Contents:

Module 1:
Cellular concepts-Cell structure, frequency reuse, cell splitting, channelassignment, handoff,interference, capacity, power control; Wireless Standards: Overview of 2G and 3G cellularstandards.

Module 2:
Signal propagation-Propagation mechanism- reflection, refraction, diffraction andscattering, largescale signal propagation and lognormal shadowing. Fading channels-Multipath and small-scalefading- Doppler shift, statistical multipath channel models, narrowband and wideband fading models,power delay profile, average and rms delay spread, coherence bandwidth and coherence time, flatand frequency selective fading, slow and fast fading, average fade duration and level crossing rate.

Module 3:
Capacity of flat and frequency selective channels. Antennas-Antennas for mobileterminal-monopoleantennas, PIFA, base station antennas and arrays.

Module 4:
Multiple access schemes-FDMA, TDMA, CDMA and SDMA.Modulationschemes- BPSK, QPSKand variants, QAM, MSK and GMSK, multicarrier modulation, OFDM.

Module 5:
Receiver structure- Diversity receivers- selection and MRC receivers, RAKEreceiver, equalization:linear-ZFE and adaptive, DFE. Transmit diversity-Altamonte scheme.

Module 6:
MIMO and space time signal processing, spatial multiplexing, diversity/multiplexing tradeoff.Performance measures- Outage, average snr, average symbol/bit error rate. Systemexamples-GSM, EDGE, GPRS, IS-95, CDMA 2000 and WCDMA.

Text Books

1. Silberschatz, P. Galvin and Greg Gagne, “Operating System Concepts”, Wiley International Company.
2. A.S. Tanenbaum, Modern Operating Systems, Prentice Hall India.

References

1. J. Archer Harris, Operating systems – Schuam’s outlines, Tata Mc Graw Hill.
2. Gary Nutt, Operating Systems – A modern perspective, Pearson Education.

HUMAN RESOURCE MANAGEMENT

HSM011

L-T-P= 3-0-0

Course Outcome:

During the study of this course, student would come to know about the theory and application of human resource management, the broad range of influences acting on human resource management, about the human resources planning and policies through its information system, training and development of human capital of the organization. This course emphasis on the knowledge of performance assessment methods, improvements and resultant in terms of employee service condition reviews. Compensation and workers participation in management including the discipline matters and strategic human resources management

Course Content:

Module 1:

Introduction:Human resources in Organizations, role of Human Resource Management; the historical background, personnel Management, Human Resource Development, Typical Organizational setup of a Human Resource Management department.

Module 2:

Human Resource Planning:Supply and Demand Forecasting methods, Man power Inventory, Career Planning, Succession Planning, Personnel Policy, Human Resource Information System (HRIS), Recruitment and Selection: Process, Sources, Methods of selection, Interviewing Method, Skills and Errors, Performance Appraisal Systems: Purpose, Methods, Appraisal instruments, 3600 Appraisal HR Score Card, Errors in appraisal, Potential Appraisal, Appraisal Interview.

Module 3:

Human Resource Development: Policy and Programs Assessment of HRD Needs, HRD, Methods: Training and Non-Training, Compensation Management: Wages- Concepts, Components; System of Wage Payment, Fringe Benefits, Retirement Benefit.

Module 4:

Workers' Participation in Management: Concept, Practices and Prospects in India, Quality Circles and other Small Group Activities. Discipline Management: Misconduct, Disciplinary action, Domestic Enquiry, Grievance Handling

Module 5:

Strategic HRM: Meaning, Strategic HRM vs Traditional HRM, SHRM Process, Nature of e-HRM, e-Recruitment & Selection e-Performance Management e-Learning

Reference Books:

1. Agarwala T.-Strategic Human Resource Management, OUP
2. Aswathappa,K.-Human Resource Management, TataMcGrawHill
3. JyothiP.&Venkatesh,D.N.-Human Resource ,Management

Eighth Semester Syllabus

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1	DE	ECD---	Discipline Specific Elective	-	-	-	3
2	DE	ECD---	Discipline Specific Elective	-	-	-	4
3	DE	ECD---	Discipline Specific Elective	-	-	-	3
4	INT	INT801	Internship/ Industrial Training/Project	0	0	8	4
5	GS	GSC808	ESP & SDP - VIII	0	1	0	1
					Total credits		15

Students will undergo training/internship in the industry / research organization / reputed Institute during the vacation

Suggestive Choice Based Subjects

Sl No.	Type	Subject Code	Topic	L	T	P	Credit Points
1	DE	ECD813	Internet of Things using Raspberry Pi	1	0	4	3
2	DE	ECD817	CMOS Design	3	0	2	4
3	DE	ECD818	Satellite Communication	3	0	0	3

CMOS DESIGN

ECD816

L-T-P= 3-0-0

Course Description: To understand basic fabrication process, with an emphasis on VLSI circuitry.

Learning Outcomes:

Upon successful completion of the course, students will be able to: A student who successfully fulfills the course requirements will have demonstrated:

1. An ability to design logic circuit layouts for both static CMOS and dynamic clocked CMOS circuits.
2. An ability to extract the analog parasitic elements from the layout and analyze the circuit timing using a logic simulator and an analog simulator.
3. An ability to build a cell library to be used by other chip designers.
4. An ability to insert elementary testing hardware into the VLSI chip.
5. An ability to analyze VLSI circuit timing using Logical Effort analysis.
6. An ability to design elementary data paths for microprocessors, including moderate-speed adders, subtractors, and multipliers.
7. An ability to estimate and compute the power consumption of a VLSI chip.
8. An ability to assemble an entire chip and add the appropriate pads to a layout
9. An ability to explain the chip technology scaling process

Module 1:
Review of MOS transistor models, Non-ideal behaviour of the MOS Transistor.Transistor as a switch.
Module 2:
Inverter characteristics, Integrated Circuit Layout: Design Rules, Parasitic. Delay: RC Delay model,linear delay model, logical path efforts. Power, interconnect and Robustness in CMOS circuit layout.
Module 3:
Combinational Circuit Design: CMOS logic families including static, dynamic and dual rail logic.
Module 4:
Sequential Circuit Design: Static circuits. Design of latches and Flip-flops.

References

1. Introduction to VLSI Circuits and Systems, John P. Uyemura John Wiley & Sons.

SATELLITE COMMUNICATION

ECD817

L-T-P= 3-0-0

Introduction:

The benefits of space technology, both direct and indirect, have introduced new dimensions into the study and understanding of Earth's processes and in improving the quality of life for the people living on it. All countries should have access to space technology and must share the benefits. An essential pre-requisite to partaking in these opportunities is the building of various indigenous capacities for the development and utilization of space science and technology. Identification of specific data and methodologies for effective mapping and evaluation of natural resources; development of geospatial models and tools to address the social and engineering problems; Application of geospatial technologies for hazard mitigation and management and several others demand the need of satellite remote sensing.

Objectives:

1. The course aims at providing students a basic knowledge about satellite communication, its services and problems associated with it
2. To provide exposure to students in gaining knowledge on concepts and applications leading to modelling of earth resources management using Remote Sensing
3. To acquire skills in advance techniques such as hyper spectral, thermal and LiDAR scanning for mapping, modelling and monitoring

Learning Outcomes:

Knowledge:

1. Prepare the students with basic concepts of satellite and problems associated with it
2. Knowledge about different modulation techniques used in satellite communication
3. Knowledge about orbits,GEO,LEO, Orbital transfer
4. Learn about RF link, optimization link, intersatellite links
5. Learn about multiple access techniques, error correcting codes
6. Fully equipped with concepts, methodologies and applications of Remote Sensing Technology.
7. Prepare the candidates for National and Global Employability
8. Acquire skills in handling instruments, tools, techniques and modelling while using Remote Sensing Technology

Application:

1. Apply principles of Remote sensing and GIS to collect, map and retrieve spatial information.
2. Plan, assess and evaluate natural and manmade systems using geospatial models and methods
3. Use geospatial tools and techniques for hazard mitigation and resource planning.
4. Pursue research and develop capabilities to handle multi-disciplinary field projects

Course Contents:

Module 1:

Introduction to Satellite Communication: Principles and architecture of satellite Communication,Brief

history of Satellite systems, advantages, disadvantages, applications and frequency bands usedfor satellite communication.

Module 2:

Orbital Mechanics: Orbital equations, Kepler's laws, Apogee and Perigee for an elliptical orbit,evaluation of velocity, orbital period, angular velocity etc. of a satellite, concepts of Solar day andSidereal day.

Module 3:

Satellite sub-systems: Study of Architecture and Roles of various sub-systems of a satellite systemsuch as Telemetry, tracking, command and monitoring (TTC & M), Attitude and orbit control system(AOCS), Communication sub-system, power sub-systems etc.

Module 4:

Typical Phenomena in Satellite Communication:Solar Eclipse on satellite, its effects, remedies forEclipse, Sun Transit Outage phenomena, its effects and remedies, Doppler frequency shiftphenomena and expression for Doppler shift.

Module 5:

Satellite link budget

Flux density and received signal power equations, Calculation of System noise temperature forsatellite receiver, noise power calculation, Drafting of satellite link budget and C/N ratio calculationsin clear air and rainy conditions.

Module 6:

Modulation and Multiple Access Schemes:Various modulation schemes used in satellite communication, Meaning of Multiple Access, Multiple access schemes based on time, frequency,and code sharing namely TDMA, FDMA and CDMA.

Text Books

1. Remote Sensing and GIS- B.Bhatta(oxford university press) Remote sensing of the Environment– J. R. Jenson (Pearson)
2. Global Navigation satellite systems - B. S. Rao(TMH)

References

1. Satellite communication– D.Roddy (TMH)
2. Remote Sensing- R.A. Schowengerdt (Academic press)