Bachelor of Technology (Electronics & Communication Engineering)

Scheme of Studies/Examination

Semester III

S. No.	Course No.	Course Title	Teaching Schedule				Allotment of Marks				Duration of Exam (Hrs)
			L	T	P	Hours/Week	Theory	Sessional	Practical	Total	
1	AS-201N	Mathematics-III	3	1	0	4	75	25	0	100	3
2	ECE-201N	Signals & Systems	3	1	0	4	75	25	0	100	3
3	ECE-203N	Electronic Devices	3	1	0	4	75	25	0	100	3
4	ECE-205N	Network Analysis & Synthesis	3	1	0	4	75	25	0	100	3
5	ECE-207N	Digital Electronics	3	1	0	4	75	25	0	100	3
6	ECE-209N	Analog Communications	3	1	0	4	75	25	0	100	3
7	ECE-211N	Signals & Systems Lab	0	0	3	3	0	40	60	100	3
8	ECE-213N	Digital Electronics Lab	0	0	3	3	0	40	60	100	3
9	ECE-215N	Analog Communications lab	0	0	3	3	0	40	60	100	3
		Total	**18**	**6**	**9**	**33**	**450**	**270**	**180**	**900**	
10	MPC-201N	Environmental Studies*	3	0	0	3	75	25	0	100	3

** MPC-201N is a mandatory course and student has to get passing marks in order to qualify for the award of degree but its marks will not be added in the grand total.*

Bachelor of Technology (Electronics & Communication Engineering)

Scheme of Studies/Examination

Semester IV

S. No.	Course No.	Course Title	Teaching Schedule				Allotment of Marks				Duration of Exam (Hrs)
			L	T	P	Hours/Week	Theory	Sessional	Practical	Total	
1	AS-206N	Numerical Analysis	4	0	0	4	75	25	0	100	3
2	ECE-202N	Data Structures & Algorithms	3	1	0	4	75	25	0	100	3
3	ECE-204N	Electronics Measurements & Instruments	3	1	0	4	75	25	0	100	3
4	ECE-206N	Electromagnetic Theory	3	1	0	4	75	25	0	100	3
5	ECE-208N	Analog Electronics	3	1	0	4	75	25	0	100	3
6	ECE-210N	Computer Architecture & Organization	3	1	0	4	75	25	0	100	3
7	ECE-212N	Data Structures Lab	0	0	3	3	0	40	60	100	3
8	ECE-214N	Electronics Measurements & Instruments Lab	0	0	3	3	0	40	60	100	3
9	ECE-216N	Analog Electronics lab	0	0	3	3	0	40	60	100	3
		Total	**19**	**5**	**9**	**33**	**450**	**270**	**180**	**900**	
10	MPC-202N	Energy Studies*	3	0	0	3	75	25		100	3

** MPC-202N is a mandatory course and student has to get passing marks in order to qualify for the award of degree but its marks will not be added in the grand total.*

Note: All the students have to undergo six weeks industrial training after IV^{th} semester and it will be evaluated in V^{th} semester.

AS-201N	MATHEMATICS-III					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 hrs**
Purpose	To acquaint the students with the basic use of PDE, Linear Programming problems, Fourier series and transforms, Complex variables and Probability.					
Course Outcomes						
CO1	This section is concerned mainly with Fourier series. However, the underlying ideas can also be extended to nonperiodic phenomena. This leads to Fourier integrals and transforms which are very much useful in solving the initial and boundary value problems.					
CO 2	Students will learn about the formation and solution the partial differential equations. First order PDE of any degree by using Charpit's method will be discussed in details. In addition, how to solve homogeneous linear PDE with constant coefficients and variable separable method and LPP will be covered under this section.					
CO 3	Complex analysis is concerned with generalization of the familiar real functions of calculus and their detailed knowledge is an absolute necessity in practical work to solve engineering problems.					
CO 4	Probability theory provides models of probability distributions(theoretical models of the observable reality involving chance effects) to be tested by statistical methods which has various engineering applications, for instance, in testing materials, control of production processes, robotics, and automatization in general, production planning and so on.					

UNIT-I

Fourier Analysis **(11 hrs)**

Fourier series: Euler's formulae, Orthogonality conditions for the Sine and Cosine funtions, Dirichlet's conditions, Fourier expansion of functions having points of discontinuity, Change of interval, Odd and even functions, Half-range series.

Fourier Transforms: Fourier integrals, Fourier transforms, Fourier Cosine and Sine transforms, Properties of Fourier transforms, Convolution theorem, Parseval's identity, Fourier transforms of the derivative of a function, Application of transforms to boundary value problems (Heat conduction and vibrating string).

UNIT-II

Partial Differential Equations and LPP **(11 hrs)**

Formation and Solutions of PDE, Lagrange's Linear PDE, First order non-linear PDE, Charpit's method, Homogeneous linear equations with constant coefficients, Method of separation of variables.

Solution of linear programming problems: using Graphical and Simplex methods.

UNIT-III

Theory of Complex Variables **(12 hrs)**

A review of concept of functions of a complex variable, Limit, continuity, differentiability and analyticity of a function. Basic elementary complex functions (exponential functions, trigonometric & Hyperbolic functions, logarithmic functions) Cauchy-Riemann Equations.

Line integral in complex plane, definition of the complex line integral, basic properties, Cauchy's integral theorem, and Cauchy's integral formula, brief of Taylor's, Laurent's and Residue theorems (without proofs).

UNIT-IV

Probability theory: **(11 hrs)**

A review of concepts of probability and random variables: definitions of probability, addition rule, conditional probability, multiplication rule, Conditional Probability, Mean, median, mode and standard deviation, Bayes' Theorem, Discrete and continuous random variables, probability mass, probability density and cumulative distribution functions, mathematical expectation, moments, moment generating function.

Standard Distributions: Binomial, Poisson and Normal distribution.

References Books:

1. E. Kreyszig : Advanced Engineering Mathematics, Wiley India.
2. B. V. Ramana: Engineering Mathematics, Tata McGraw Hill.
3. R.K. Jain, S.R.K. Iyengar: Advanced Engineering Mathematics, Taylor & Francis.
4. Murray R Spiegel: Schaum's Outline of Complex Variables, McGraw Hill Professional.
5. Michael D. Greenberg: Advanced Engineering Mathematics, Pearson Education, Prentice Hall.

Note: The Examiners will set nine questions: first question will be short answer type (covering the entire syllabus) and another eight questions will be set taking two questions from each unit. Students will have to attempt five questions in all; first question will be compulsory and other four questions, selecting one from each unit. All questions will carry equal marks.

ECE-201N	Signals and Systems					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the basic concepts of signals and systems, Random variables, discretisation of analog signals, fourier series, fourier transform and laplace transform.**					
Course Outcomes						
CO1	**Introduce and classify signals and systems based on their properties.**					
CO2	**To understand the basic concepts of random variables and Linear time invariant systems.**					
CO3	**Familiarization with the sampling process and spectral analysis of signals using fourier series.**					
CO4	**Apply transform techniques to analyze continuous-time and discrete-time signals and systems**					

Unit-I

Introduction to Signals: Continuous and discrete time signals, deterministic and stochastic signals, periodic and a periodic signals, even and odd signals, energy and power signals, exponential and sinusoidal signals and singular functions. Signal representation in terms of singular functions, orthogonal functions and their use in signal representation

Introduction to Systems: Linear and non-linear systems, time invariant and time varying systems, lumped and distributed systems,deterministic and stochastic systems, casual and non-causal systems, analog and discrete/digital memory and memory less systems.

Unit-II

Random Variables: Introduction to Random Variables, pdf, cdf, moments, distributions, correlation functions.

Linear Time Invariant Systems: Introduction to linear time invariant (LTI) systems, properties of LTI systems, convolution integral, convolution sum, causal LTI systems described by differential and difference equations. Concept of impulse response

Unit-III

Discretisation of Analog Signals: Introduction to sampling, sampling theorem and its proof.Effect of undersampling, reconstruction of a signalfrom sampled signal.

Fourier Series : Continuous time fourier series (CTFS), Properties of CTFS, Convergence of fourier series, Discrete time Fourier Series (DTFS), Properties of DTFS **,** Fourier series and LTI system, Filtering.

Unit-IV

Fourier Transform: Continuous Time Fourier Transform (CTFT), Properties of CTFT, Systems characterized by linear constant- coefficient differential equations.

Discrete time fourier transform (DTFT), Properties of DTFT, Duality, Systems characterized by Linear constant coefficient difference equations.

Laplace Transform: Introduction to Laplace transform, Region of convergence for laplace transform, Inverse laplace transform, Properties oflaplace transform, Analysis and characterization of LTI systems using laplace transform, System function algebra and block diagram representations, Unilateral laplace transform.

Text Books:

1. Alan V. Oppenheim, Alan S. Willsky, S. Hamid Nawab, Signals and Systems, Prentice Hall India, 2nd Edition, 2009

Reference Books:

1. Simon Haykins – “Signal & Systems”, Wiley Eastern
2. Tarun Kumar Rawat , Signals and Systems , Oxford University Press.

Note: Question paper template will be provided to the paper setter.

ECE - 203N	Electronic Devices					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the various electronic devices such as various types of diodes, BJT's, FET's and regulated power supplies.**					
Course Outcomes						
CO1	**To understand the concept of carrier transport phenomena in semiconductors and various diodes such as p-n junction diode, tunnel diode and schottky diodes.**					
CO2	**To understand the detailed concept of BJT's and calculation of parameters of transistors using different models.**					
CO3	**Describe the characteristics & parameters of FET's and MOSFET's.**					
CO4	**To understand the concept of different types of regulated power supplies.**					

Unit- I

Carrier Transport Phenomena: Carrier Drift, Carrier Diffusion, Hall Effect, Mobility and Resistivity. Generation and Recombination of carriers, Fermi energy level, its position and its variation with doping concentration.**PN Junction**: Basic Structure, Built in potential Barrier, Electric Field, Space charge width, Junction capacitances: Depletion & Diffusion Capacitance, Small signal model of PN Junction Diode. Tunnel Diode, Schottky Diode**.**

Unit- II

Bipolar Junction Transistor: Basic principle of operation, Forward Active mode & other modes. Non Ideal Effects: Base Width Modulation, Current Crowding, High Injection. Ebers-Moll Model, Frequency Limitations of BJT'S, Hybrid Pi Model, Introduction to H-Parameters, Hetrojunction Bipolar Transistors.

Unit -III

Field Effect Devices: JFET concepts, Basic Operation, Internal pinch off voltage, Pinch off voltage, Ideal DC current voltage relationship, Transconductance, Channel length modulation, velocity saturation effects, Small Signal Model & Frequency Limitations.Two Terminal MOS structure, Energy band diagrams, Depletion layer thickness, Capacitance Voltage Relationship, Basic MOSFET operation, Small Signal Model.

Unit-IV

Regulated Power Supplies: Voltage Regulation, Zener diode shunt voltage regulator, Transistor series and Transistor shunt voltage regulator, Controlled Transistor Voltage Regulator, Op-Amp Series voltage regulator, Complete power supply and SMPS.

Text Books:

1. D. A. Neamen,DhrubesBiswas Semiconductor Physics and Devices (IRWIN), McGraw Hill Higher Education, 4th Edition
2. B.G. Streetman, Solid State Electronic Devices, Prentice Hall of India, New Delhi, 1995.

Reference Books:

1. E S. Yang, Microelectronic Devices, McGraw Hill, Singapore, 1988.
2. A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College Publishing, 1991.
3. Millman&Halkias: Integrated Electronics, TMH.
4. Boylestad&Nashelsky: Electronic Devices & Circuit Theory, PHI.

Note: Question paper template will be provided to the paper setter.

ECE-205N	Network Analysis and Synthesis					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the concepts of topology, transient analysis, network modeling, filters and methods of network analysis and synthesis for solving simple and complex circuits.**					
Course Outcomes						
CO1	**To understand the concept of network topologies and the network analysis in the time domain for solving simple and complex circuits.**					
CO2	**Describe the circuit element models, network analysis using Laplace transform and time domain behavior from the pole-zero plots.**					
CO3	**Describe the characteristics & parameters of two port networks.**					
CO4	**To understand the concept of filters and synthesis of one port network.**					

Unit -I

Introduction: Principles of network topology, graph matrices, Network Analysis (Time-Domain): Singularity Functions, Source-Free RC, RL, Series RLC, Parallel RLC circuits, Initial & Final Conditions, Impulse & Step Response of RC, RL, Series RLC, Parallel RLC circuits.

Unit-II

Network Analysis (using Laplace Transform): Circuit Element Models, Transient Response of RC, RL, RLC Circuits to various excitation signals such as step, ramp, impulse and sinusoidal excitations using Laplace transform.

Network Functions: Terminal pairs or Ports, Network functions for one-port and two-port networks, poles and zeros of Network functions, Restrictions on pole and zero Locations for driving point functions and transfer functions.

Unit-III

Characteristics and Parameters of Two Port Networks: Relationship of two-port variables, short-circuit admittance parameters, open circuit impedance parameters, transmission parameters, hybrid parameters, relationships between parameter sets, Inter-connection of two port networks.

Unit-IV

Types of Filters and their Characteristics: Filter fundamentals, constant-k and m-derived low-pass and high-pass filters.

Network Synthesis: Causality & Stability, Hurwitz Polynomials, Positive real functions, Synthesis of one port networks with two kind of elements.

Text Books:

1. Fundamentals of Electric Circuits: Charles K. Alexander, Matthew N. O. Sadiku, McGraw Hill Education
2. Network Analysis: M.E. Van Valkenburg, PHI

Reference Books:

1. Circuits & Networks: Sukhija & Nagsarkar, Oxford Higher Education.
2. Network Analysis & Synthesis: F. F. Kuo, John Wiley.
3. Basic Circuit Theory: Dasoer Kuh, McGraw Hill Education.
4. Circuit Analysis: G.K. Mithal; Khanna Publication

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Note: Question paper template will be provided to the paper setter.

ECE-207N	Digital Electronics					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the concepts of Digital Electronics covering the contents of digital techniques, logic gates & logic families etc.**					
Course Outcomes						
CO1	**Students will be able to design a minimum circuit for any function**					
CO2	**Students will be able to analyze various logic families available to design digital components**					
CO3	**Students will be able to design state machine circuits using sequential and combinational circuits**					
CO4	**Students will be able to understand the basics of various PLD's.**					

Unit-I

Introduction to Digital Techniques: Digital Systems; Logic circuits, Analysis, design and implementation of digital systems, Number Systems and Codes- Positional number system; Binary, octal and hexadecimal number systems; Methods of base conversions; Binary, octal and hexadecimal arithmetic; Representation of signed numbers; Fixed and floating point numbers; Binary codes: BCD codes, Excess-3, Gray codes; Error detection and correction codes - parity check codes and Hamming code.

Combinatonial Design using Gates: Combinatonial Logic Systems: Definition and specification; Truth table; Basic logic operation and logic gates. Basic postulates and fundamental theorems of Boolean algebra;Standard representation of logic functions : SOP and POS forms; Simplification of switching functions using K-map and Quine-McCluskey tabular methods; Synthesis of combinational logic circuits using AOI, NAND,NOR and other combination of other logic functions.

Unit-II

Logic families: Introduction to different logic families; Operational characteristics of BJT in saturation and cut-off regions; Operational characteristics of MOSFET as switch; TTL inverter - circuit description and operation; CMOS inverter - circuit description and operation; Structure and operations of TTL ,CMOS and ECL gates; Electrical characteristics of logic gates – logic levels and noise margins, fan-out, propagation delay, transition time, power consumption and power-delay product; interfacing of TTL and CMOS families.

Combinational design using MST devices: Encoders, Decoders, multiplexers, demultiplexers and their use as logic elements; Parity circuits and comparators; Arithmetic modules- adders, subtractors , BCD arithmetic circuits.

Unit-III

Sequential circuits: Definition of state machines, state machine as a sequential controller; Basic sequential circuits- latches and flip-flops: SR-latch, D-latch, D flip-flop, JK flip-flop, T flip-flop; Timing hazards and races; Analysis of state machines using D flip-flops and JK flip-flops; Design of state machines - state table, state assignment, transition/excitation table, excitation maps and equations, logic realization;

State machine design: Designing state machine using ASM charts, Designing state machine using state diagram, Design of registers, counters-asynchronous and synchronous, up/down counter, Ring and Johnson counters.

Unit-IV

Memory – Organization, Functional Diagram, Memory operations, Classification of semiconductor memories, Read and Write Memories, ROM, Programmable Logic Devices-PLAs, PALs and their applications, Generic Array logic devices, Sequential PLDs and their applications; Introduction to field programmable gate arrays (FPGAs) and ASICS.

Text Books:

1. G.K.Kharate: Digital Electronics,1st edition, Oxford university press, 2010

Reference Books:

1. M.M.Mano and M.D.Ciletti: Digital design4th edition, Printece Hall.2006
2. R.P.Jain: Modern Digital Electronics, 3rd edition, TMH.2003
3. A.A.Kumar: Fundamentals of digital circuits,2nd edition, Printece Hall of India
4. A.P.Malvino and D.P.Leach: Digital principles and applications,6th edition,TMH,2008
5. Z. Kohavi, Switching and Finite Automata Theory, McGraw Hill, 1970.

Note: Question paper template will be provided to the paper setter.

ECE-209N	Analog Communications					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the concepts of basic communication systems and various noises in that system, different analog modulation techniques and also AM&FM transmission & reception with various pulse techniques.**					
Course Outcomes						
CO1	**To understand the concept of basic comm. System and various types of noise and analog modulation techniques.**					
CO2	**To understand the concept of AM transmission & reception.**					
CO3	**To understand the concept of FM transmission & reception.**					
CO4	**To understand the concept of SSB transmission & reception and analog pulse techniques.**					

Unit-I

Communication Systems and Noise: Constituents of communication system, Modulation, Bandwidth requirement, Noise, Classification of noise, Resistor noise, Multiple resistor noise sources, Network with reactive elements, Noise Temperature, Noise bandwidth, Noise figure, its calculation and measurement, Bandpass noise representation, Noise calculation in Communication Systems, Noise in Amplitude Modulated System, Noise in angle modulated systems, SNR calculation for AM and FM.

Analog Modulation Techniques: Theory of amplitude modulation, AM power calculations, AM modulation with a complex wave, Concepts of angle modulation, Theory of frequency modulation, Mathematical analysis of FM, Spectra of FM signals, Narrow band FM, Wide band FM, Phase modulation, Phase modulation obtained from frequency modulation, Comparison of AM, FM & PM.

Unit-II

AM Transmission: Generation of Amplitude Modulation, Low level and high level modulation, Basic principle of AM generation, Square law modulation, Amplitude modulation in amplifier circuits, Vander bijl modulation, Suppressed carrier AM generation (Balanced Modulator) ring Modulator, Product Modulator/balanced Modulator.

AM Reception: Tuned Ratio Frequency (TRF) Receiver, Super heterodyne Receiver, RF Amplifier, Image Frequency Rejection, Cascade RF Amplifier, Frequency Conversion and Mixers, Tracking & and Alignment, IF Amplifier, AM detector, AM detector with AGC, Distortion in diode detectors, Double hetro-dyne receiver, AM receiver using a phase locked loop (PLL), AM receiver characteristics.

Unit-III

FM Transmission: FM allocation standards, Generation of FM by direct method, Varactor diode Modulator, Indirect generation of FM, The Armstrong method RC phase shift method, Frequency stabilized reactance FM transmitter, FM stereo transmitter, Noise triangle.

FM Reception: Direct methods of Frequency demodulation, Travis detector/frequency discrimination (Balanced stop detector), Foster seelay of phase discriminator, Ratio detector, Indirect method of FM demodulation, FM detector using PLL, Pre-emphasis / de-emphasis, Limiters, The FM receiver, RF

Amplifier, FM stereo receiver, Square, Triangular, Sinusoidal FM generation Voltage controlled oscillator.

Unit-IV

SSB Transmission: Introduction, Advantages of SSB Transmission, Generation of SSB, The Filter method The Phase Shift Method, The Third Method, AM Compatible SSB Modulation, Pilot Carrier SSB, Independent Side-band Systems (ISB), Vestigial Side-band Modulation (VSB), VSB-SC, Application of AM and FM in TV transmission.

SSB Reception: SSB Product Demodulator, Balanced Modulator as SSB Demodulator, Pilot Carrier SSB Receiver, SSB Double Super-hetrodyne Receiver, Compatible SSB (CSSB) Receiver, ISB/Suppressed Carrier Receiver, Modern Communication Receiver.

Analog Pulse Modulation: Introduction, Pulse amplitude modulation (PAM), Natural PAM Frequency Spectra for PAM, PAM Time Multiplexing Flat-top PAM, PAM Modulator Circuit, Demodulation of PAM Signals, Pulse Time Modulation (PTM), Pulse Width Modulation (PWM), Pulse Position Modulation (PPM), PPM Demodulator,

Text Books:

1. Proakis, J. G. and Salehi, M., Fundamentals of Communication Systems, Dorling Kindersley (2008) 2nd ed.
2. Mithal G K, Radio Engineering, Khanna Pub.

Reference Books:

1. Taub, H., Principles of Communication Systems, McGraw-Hill (2008) 3rd ed.
2. Haykin, S., Communication Systems, John Willey (2009) 4th ed
3. Kennedy, G., Electronic Communication Systems, McGraw-Hill (2008) 4th ed.

Note: Question paper template will be provided to the paper setter.

ECE-211N	Signals and Systems Lab					
Lecture	**Tutorial**	**Practical**	**Practical**	**Sessional**	**Total**	**Time**
0	**0**	**3**	**60**	**40**	**100**	**3 Hr.**
Course Outcomes						
CO1	**To understand the basic concepts of MATLAB**					
CO2	**To explore properties of various types of signals and systems.**					
CO3	**To visualize the relationship between continuous and discrete fourier transforms.**					
CO4	**To understand the concept of sampling in time and frequency domain.**					

List of Experiments:

1) To demonstrate some simple signal.

2) To explore the effect of transformation of signal parameters (amplitude-scaling, time-scaling and time-shifting).

3) To explore the various properties of the impulse signals.

4) To visualize the complex exponential signal and real sinusoids.

5) To identify a given system as linear or non-linear.

6) To explore the time variance and time invariance property of a given system.

7) To explore causality and non-causality property of a system.

8) To visualize the relationship between the continuous-time Fourier series and Fourier transform of a signal.

9) To visualize the relationship between the discrete-time Fourier series and Fourier transform of a signal.

10) To visualize the relationship between continuous-time and discrete-time Fourier transform of a signals.

11) To demonstrate the time domain sampling of bandlimited signals (Nyquist theorem).

12) To demonstrate the time domain sampling of non-bandlimited signals and antialiasing filter.

13) To demonstrate the signal reconstruction using zero-order hold and first-order hold filters.

14) To demonstrate the sampling in frequency domain (Discrete Fourier Transform).

15) To demonstrate the spectral analysis using Discrete Fourier Transform.

17) To demonstrate the convolution and correlation of two continuous-time signals.

18) To demonstrate the convolution and correlation of two discrete-time signals.

ECE-213N	Digital Electronics Lab					
Lecture	**Tutorial**	**Practical**	**Practical**	**Sessional**	**Total**	**Time**
0	**0**	**3**	**60**	**40**	**100**	**3 Hr.**

Course Outcomes	
CO1	**To understand the concept of TTL gates such as AND, OR, NAND etc.**
CO2	**To study and verify various combinational circuits such as multiplexers, Comparators etc.**
CO3	**To understand the concept of sequential circuits such as flip flops, counters etc.**
CO4	**To design the state machine of four states and to study a sequence detector.**

List of Experiments:

1. Study of TTL gates AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR.
2. Design and realize a given function using K-Maps and verify its performance.
3. To verify the operation of Multiplexer and Demultiplexer.
4. To verify the operation of 2 bit Comparator using gates.
5. To verify the truth table of S-R, J-K, T, D Flip-flops.
6. To verify the operation of Bi-directional shift register.
7. To design and verify the operation of 3-bit asynchronous counter.
8. To design and verify the operation of asynchronous Up/down counter using J-K FFs.
9. Design a state machine of 4 states.
10. To design a sequence detector.

ECE-215N	Analog Communications Lab					
Lecture	**Tutorial**	**Practical**	**Practical**	**Sessional**	**Total**	**Time**
0	**0**	**3**	**60**	**40**	**100**	**3 Hr.**
Course Outcomes						
CO1	**To study various modulation techniques of Amplitude modulation and also demodulation.**					
CO2	**To study the generation techniques of SSB and DSBSC modulation**					
CO3	**To understand the concept of PLL , its capture range and frequency multiplier using PLL.**					

List of Experiments:

1. i) To study Double Sideband Amplitude Modulation and determine its modulation factor and power in sidebands.
   ii) To study amplitude demodulation by linear diode detector.
2. i) To study Frequency Modulation and determine its modulation factor.
   ii) To study PLL 565 as frequency demodulator
3. To study Sampling and reconstruction of pulse amplitude modulation system.
4. To study the Sensitivity characteristics of superhetrodyne receiver.
5. To study the Selectivity characteristics of superhetrodyne receiver.
6. To study the Fidelity characteristics of superhetrodyne receiver.
7. i) To study Pulse Amplitude Modulation
   a) Using switching method
   b) By sample and hold circuit.

   ii) To demodulate the obtained PAM signal by IInd order Low pass filter.
8. To study Pulse Width Modulation / Demodulation.
9. To study Pulse Position Modulation / Demodulation.
10. To study active filters (Low-pass, High-pass, Band-pass, Notch filter).

MPC-201N	Environmental Studies (B.Tech. All Branches Semester –III/IV)					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**0**	**0**	**75**	**25**	**100**	**3 Hrs.**
Purpose	**To learn the multidisciplinary nature, scope and importance of Environmental Studies**					
Course Outcomes						
CO1	**Basic concepts of Various kinds of Microscopy and Centrifugation Techniques**					
CO2	**To learn the theoretical and practical aspects of Electrophoresis and Chromatography Techniques**					
CO3	**To learn the concepts of different kinds of Spectroscopy and Colourimetry**					
CO4	**To understand the concept of radioisotope techniques and their applications in research**					

UNIT 1

The multidisciplinary nature of environmental studies.Definition, Scope and Importance. Need for public awareness. Natural Resources: Renewable and Non-Renewable Resources: Natural resources and associated problems.

(a) Forest Resources: Use and over-exploitation, deforestation, case studies. Timber eztraction, mining, dams and their effects on forests and tribal people.
(b) Water Resources- Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
(c) Mineral Resources- Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
(d) Food Resources- World Food Problems, changes caused by agriculture and overgazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
(e) Energy Resources- Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies.
(f) Land Resources- Land as a resource, land, degradation, man induced landslides, soil erosion and desertification.

Role of an individual in conservation of natural resources.Equitable use of resources for sustainable lifestyle.

UNIT II

Ecosystem-Concept of an ecosystem.Sturcture and function of an ecosystem.Producers, consumers and decomposers.Energy flow in the ecosystem.Ecological Succession.Food Chains, food webs and ecological pyramids. Introduction, types,characteristic features, structure and function of the following ecosystem-

a. Forest Ecosystem
b. Grassland Ecosystem
c. Desert Ecosystem
d. Aquatic Ecosystems(ponds, streams, lakes, rivers, oceans, esturaries

Field Work. Visit to a local area to document Environment assets-river/forest/grassland/hill/mountain.Visit to a local polluted site- Urban /Rural

Industrial/Agricultural.Study of common plants, insects and birds. Study of simple ecosystems-pond, river, hill, slopes etc. (Field work equal to 5 lecture hours).

UNIT III

Biodiversity and its conservation. Introduction, Definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversityof global, National and local levels. India as a mega-diversity nation Hot spots of Biodiversity. Threats to biodiversity: Habitat loss, poaching of wild life, man-wildlife conflicts. Endangered and endemic species of India.Conservation of Biodiversity- In situ and Ex-Situ conservation of biodiversity.

Environmental Pollution Defiinitiom. Cause, effects and control measures of- (a) Air Pollution (b) Water Pollution (c) Soil Pollution (d) Marine Pollution (e) Noise Pollution (f) Thermal Pollution (g) Nuclear Hazards
Solid waste management- cause, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.Pollution case studies. Disaster management: floods, earthquake, cyclone and landslides

UNIT IV

Social Issues and the Environment.From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people: Its problems and concerns. Case Studies.Environmental ethics-issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.Wasteland Reclamation.Consumerism and waste products.Environment Protection Act.Air (Prevention and Control of Pollution) Act.Water (Prevention and Control of Pollution) Act.Wildlife Protection Act.Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public Awareness. Human population and the Environment.Population growth, variation amomg nations. Population explosion-Family Welfare Programme. Enviromments nd human health.Human rights.Value Education.HIV/AIDS, Women and Child Welfare.Role of Information Technology in Environment and Human Health.Case Studies.

Text Books

1. Environmental Studies- Deswal and Deswal. Dhanpat Rai & Co.
2. Environmental Science & Engineering Anandan, P. and Kumaravelan, R. 2009. Scitech Publications (India) Pvt. Ltd., India
3. Environmental Studies. Daniels Ranjit R. J. and Krishnaswamy. 2013. Wiley India.
4. Environmental Science- Botkin and Keller. 2012. Wiley , India

AS-206N	NUMERICAL ANALYSIS					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
4	**0**	**0**	**75**	**25**	**100**	**3 hrs**
Purpose	To acquaint the students with the complete procedure to numerically approximate the solution for different kinds of problems occur in science, engineering and technology whose exact solution is difficult to find.					
Course Outcomes						
CO1	In this section student will learn the methods to find the roots of nonlinear (algebraic or transcendental) equations, and eigen value problem of a matrix that can be obtained numerically where analytical methods fail to give solution.					
CO2	Students will learn to solve a large system of linear equations and matrix inversion by various numerical methods and techniques.					
CO3	Discussion on interpolation will be useful in constructing approximate polynomial to represent the huge amounts of experimental data, and to find the intermediate values. Numerical differentiation and integration find application when the function in the analytical form is too complicated or the huge amounts of data are given such as series of measurements, observations or some other empirical information.					
CO4	Since many physical laws are couched in terms of rate of change of one/two or more independent variables, most of the engineering problems are characterized in the form of either nonlinear ordinary differential equations or partial differential equations. The methods introduced in the solution of ordinary differential equations will be useful in attempting many engineering problem.					

UNIT - I

Solution of Algebraic and Transcendental Equation and Eigen Value Problem: Solution of algebraic and transcendental equation by the method of bisection, the method of false position, Newton-Raphson method and Graeffe's Root squaring method. Eigen value problem by power method and Jacobi method.

UNIT-II

Solution of System of Equations and Matrix Inversion: Solution of linear algebraic equation: Gauss elimination and Gauss-Jordan methods- Method of Triangularization and Crout's reduction. Iterative methods: Gauss-Jacobi, Gauss-Seidel and Relaxation methods. Matrix inversion by Gauss - Jordan elimination, Crout's , Doolittle and Choleski Methods.

UNIT-III

Interpolation: Finite Differences, Relation between operators - Interpolation by Newton's forward and backward difference formulae for equal intervals. Newton's divided difference method and Lagrange's method for unequal intervals. Gauss Central difference formulae, Bessel and Stirling formulae.

Numerical differentiation: Newton's forward difference formula to compute derivatives, Newton's backward difference formula to compute derivatives, Derivatives using Central difference formulae, to find the maxima and minima of a tabulated function.

Numerical Integration: by Newton's Cotes formulae, Trapezoidal and Simpson's $1/3^{rd}$ and $3/8^{th}$ rules, Romberg method.

UNIT-IV

Solution of Ordinary Differential Equation: Single step methods: Taylor series method, Picard's method of successive approximation, Euler, Modified Euler's and Improved Euler methods, Runge Kutta method of fourth order only. Multistep methods: Milne and Adams– Bashforth methods.

Curve fitting: Introduction, Principle of Least squares, Method of Least squares, Fitting of a straight line, parabola and exponential functions.

References Books:

- M. K. Jain, SRK Iyengar and R.K. Jain, Numerical Methods For Scientific & Engg 6e, New Age International (P) Ltd (2008), ISBN-13:978-8122420012.

- Kendall E. Atkinson, An Introduction to Numerical Analysis, Wiley; 2 edition, (January 17, 1989), ISBN-10: 0471624896 , ISBN-13: 978-0471624899.
- S. C. Chapra and Raymond P Canale, Numerical Methods for Engineers, Tata McGraw Hill, Indian Edition.
- James Scarborough, Numerical Mathematical Analysis, Oxford & IBH Publishing Co. Pvt. Ltd (1950), ISBN 10: 0009780021, ISBN-13:978-0009780021.
- C.F. Gerald and O.P. Wheatley, Applied Numerical Analysis, Addison Wesley; 7 edition (2003), ISBN-13:978-0321133045.

Additional Readings:

- S.S. Sastry, Introductory Methods of Numerical Analysis, Prentice Hall of India Pvt. Ltd. (2007), ISBN-13: 978-8120327610.
- Babu Ram, Numerical Methods, Pearson, ISBN 978-8-317-3221-2.
- P.Thangaraj, Computer Oriented Numerical Methods, PHI, ISBN 978-81-203-3539-4.

Note: The Examiners will set nine questions: first question will be short answer type (covering the entire syllabus) and another eight questions will be set taking two questions from each unit. Students will have to attempt five questions in all; first question will be compulsory and other four questions, selecting one from each unit. All questions will carry equal marks.

ECE-202N	Data Structures & Algorithms					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the concepts of C basics, and basic algorithms using data structures such as searching and sorting, operations of linked lists and basics of trees and graphs.**					
Course Outcomes						
CO1	**Students will be able to recall 'C' basics and design basic algorithms using various data structures**					
CO2	**Students will be able to design implement various searching and sorting algorithms on arrays.**					
CO3	**Students will be able to use pointers to perform various operations of linked lists**					
CO4	**Students will be able to understand the basics of trees and Graphs.**					

Unit-I

Overview of 'C': History, Characters used in 'C", Data Types, 'C' Tokens, Structures of 'C' program, Operators and Expressions, Flow of Control, I/O functions, Arrays, Structures, user defined data types
Introduction: Overview, Concept of Data Structures, Design of suitable Algorithm, Algorithm analysis

Unit-II

Arrays - Searching and Sorting: Introduction, 1-D arrays - addressing an element in an array, array traversal, insertion and deletion, Multi-D arrays, representation of arrays in physical memory, application of arrays, Searching algorithms: linear search, binary search. Sorting algorithms: selection sort, insertions sort, bubble sort, shell sort, merge sort, radix sort (Algorithm and Analysis).
Stacks and Queues: Stacks operations, Applications of Stacks – Arithmetic operations using Infix to prefix and postfix notations, their conversion and evaluation, Queues operations, Circular, Priority queue and Deque.

Unit-III

Pointers: Introduction, Pointer variables, pointers and arrays, array of pointer, pointers and structures, Dynamic allocation
Linked Lists: Introduction, linked lists, operations on linked lists (Creation, Traversing, Searching, Insertion and Deletion), Circular and doubly linked list, Linked Stacks and Linked Queues, Comparison of sequential and linked storage.

Unit- IV

Trees: Binary Trees, representation of trees (Linear and linked), Traversal of binary trees. Types of binary trees: Expression tree, Binary search tree, Heap tree, threaded binary trees.
Graphs: Introduction, Graph terminology, various representations of Graphs, operations: Insertion, Deletion and traversal.

Text Books:

1. Data Structures using C by A. K. Sharma , Pearson Publication
2. Theory & Problems of Data Structures by Jr. Symour Lipschetz, Schaum's outline by TMH.

Reference Books:

1. Data Structures using C by A. M. Tenenbaum, Langsam, Moshe J. Augentem, PHI Pub
2. Data Structures and program design in C by Robert Kruse, PHI Expert Data Structures with C by R.B. Patel

Note: Question paper template will be provided to the paper setter.

ECE-204N	Electronics Measurements and Instruments					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the concepts of Electronics Measurements like measurement of voltage, current & resistance etc.**					
Course Outcomes						
CO1	**Students will learn the techniques of measurement of resistance using different bridges**					
CO2	**AC Bridges & Voltage Indicating & Recording Devices will be introduced to the students**					
CO3	**Students will be able to recognize the functioning of different Analog & Digital Instruments**					
CO4	**Transducers & Data Acquisition Systems will be introduced to the students**					

Unit-I

Measurement and Error: Functional elements and generalized configuration of a measuring Instrument, Characteristics of instruments, errors in measurements and their statistical analysis.

Measurement of Resistance: Wheat stone bridge, Carey-Foster Bridge, Kelvin double bridge, Measurement of Insulation resistance.

Unit-II

A-C Bridges: Maxwell Inductance bridge. Maxwell Inductance Capacitance Bridge, Anderson's Bridge, Hay's Bridge, De-Sauty's Bridge, Schering's bridge and Wein's bridge.

Voltage Indicating and Recording Devices: Analog voltmeters and Potentiometers, Self balancing potentiometer and X-Y recorders, Galvanometers - Oscillographs, Cathode - Ray Oscilloscopes, Magnetic Tape Recorders.

Unit-III

Electronic Instruments: Wave analyzer, Distortion meter: Q-meter. Measurement of Op-Amp parameters.

Digital Instruments: Digital Indicating Instruments, Comparison with analog type, digital display methods, digital methods of time and frequency measurements, digital voltmeters.

Unit-IV

Transducers: Classification of Transducers, Strain Gauge, Displacement Transducers - Capacitive Transducers, LVDT, Piezo-electric Transducers, Temperature Transducers – resistance thermometer, Thermocouples and Thermistors, Liquid level measurement Low pressure (vacuum) measurement.

Data Acquisition Systems: A to D and D to A converters, Analog and Digital Data Acquisition Systems, Multiplexing, Spatial Encoders, Telemetry.

Text Book:

1. A Course in Electrical and Electronics Measurements and Instrumentation: A.K. Sawhney; Dhanpat Rai & Sons.

Reference Books:

1. Electronics Instrumentation and Measurement Techniques: Cooper W.D & Helfrick A.D.; PHI
2. Doeblin E.O., Measurement Systems: Application & Design, Mc Graw Hill.

Note: Question paper template will be provided to the paper setter.

ECE-206N	Electromagnetic Theory					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the concepts of Electric & Magnetic Fields and make them understand the phenomenon of propagation of electromagnetic waves.**					
Course Outcomes						
CO1	**Basics of electrostatics including dielectric properties will be covered.**					
CO2	**Basics of magneto-statics and Maxwell's equations will be covered.**					
CO3	**Fundamentals of Uniform plane waves and their propagation in different mediums will be covered.**					
CO4	**Fundamentals of Transmission Lines and different modes of wave propagation in waveguides will be covered.**					

Unit-I

Electric Field and Current: Introduction to Vectors:Addition, Subtraction, Multiplication & Differentiation. Coordinate Systems: Rectangular, Cylinderical & Spherical. Coulomb's law. Electric Field Intensity, Electric Potential,Field of a Line Charge, Field of a Sheet of Charge, Electric Flux Density,Electric Dipole, Current Density, Continuity of Current, Gauss's Law and Applications, Electric Field Behaviour in Dielectrics, Boundary Conditions at Interface between Two Dielectrics, Method of Images,Capacitance of Two Wire Line, Poisson's and Laplace's Equations, Uniqueness Theorem.

Unit-II

Magnetic Field and Maxwell Equations: Biot - Savart Law. Ampere's law, Magnetic Vector potentials, Force on a moving charge, Differential Current Element, Force and Torque on a Closed Circuit, Magnetic Boundary Conditions, the Magnetic Circuit,Faraday's Law, Maxwell's Equations in Point and Integral form for Free space, Good Conductors & Lossy Dielectric for Sinusoidal Time Variations& Static Fields, Retarded potentials.

Unit-III

The Uniform Plane Wave: Plane Waves & its Properties, Wave Equation for Free Space and Conducting Medium, Propagation of Plane Waves in Lossy Dielectrics,Good Dieletrics& Good Conductors. The Poynting Vector and Power considerations, Skin Effect, Reflection of Uniform Plane Waves (Normal & Oblique Incidence).

Unit-IV

Transmission Lines and Waveguides: The Transmission Line Equations, Graphical Methods, Smith chart, Time-domain and Frequency- domain Analysis, Reflection in Transmission Lines, SWR. TE, TM, TEM waves, TE and TM modes in Rectangular and Circular Waveguides, Cut-off & Guided Wavelength, Wave Impedance and Characteristic Impedance, Dominant Modes, Power Flow in waveguides, Excitation of Waveguides, Dielectric Waveguides.

Text Books:

1. Hayt W H., Engineering Electromagnetics, Tata McGraw Hill, 6th Edition.

References Books:

1 Jordan E C & Balmain K G, Electromagnetic Waves and Radiating Systems, PHI.2 David K. Chang, Field and Waves Electromagnetics, Addison Wesley.

Note: Question paper template will be provided to the paper setter.

ECE-208N	Analog Electronics					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the concepts of various models of BJT's and FET's, multistage amplifiers, concept of feedback and its topologies, oscillators and detail of operational amplifiers with its applications.**					
Course Outcomes						
CO1	**To understand the concept of various amplifiers using BJT and FET and various transistor models**					
CO2	**Describe the frequency response of multistage amplifiers and the detailed concept of feedback topologies.**					
CO3	**To understand the concept of Barkhausen criteria of oscillation and various RC and LC oscillators and their frequency of oscillation.**					
CO4	**To understand the concept of Operational amplifier and its various applications such as current mirror, Schmitt trigger and various op-amp parameters.**					

Unit -I

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

Unit -II

Transistor Frequency Response: High frequency transistor models, frequency response of single stage and multistage amplifiers, cascode amplifier. Various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity 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.

Unit -III

Oscillators: Review of the basic concept, Barkhausen criterion for oscillators,type of RC oscillators : RC phase shift oscillator , Wien bridge oscillator , LC oscillators : Hartley oscillator, Collpit oscillator , Clapp oscillator ,555 Timer as a monostable and astable multivibrator.

Unit -IV

Op-Amp Applications: Schmitt trigger and its applications. Current mirror: Basic topology and its variants, V-I characteristics, output resistance and minimum sustainable voltage (VON), maximum usable load. Differential amplifier: Basic structure and principle of operation, calculation of differential gain, common mode gain, CMRR and ICMR. OP-AMP design: design of differential amplifier for a given specification, design of gain stages and output stages.

Text Books:

1. Electronic Devices and Circuits by Millman and Halkias, McGraw Hills, New Delhi

Reference Books:

1. Operational Amplifiers and Linear Integrated Circuits by Ramakant A Gayakwad,PHI.
2. A.S. Sedra & K.C.Smith, Microelectronics Circuits, Oxford University Press
3. Robert L. Boylestad & Louis Nashelsky, Electronic Devices & Circuit Theory,Pearson

Note: Question paper template will be provided to the paper setter.

ECE-210N	Computer Architecture & Organization					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the concepts of basic structure of computer hardware & software, Control & processor design and memory & system organisation.**					
Course Outcomes						
CO1	**To understand the concept of basics of computer hardware & software**					
CO2	**To understand the concept of control design & processor design**					
CO3	**To familiarize with the concept of various memory systems.**					
CO4	**To familiarize with the concept of system organisation.**					

Unit-I

Basic Structure of Computer Hardware and Software: Introduction to basic computer architecture, register transfer, bus and memory transfers, arithmetic, logic and shift micro operations.

Central Processing Unit: Introduction, general register organization, stack organization, instruction formats, addressing modes, data transfer and manipulation, program control, RISC, Macros and Subroutines.

Unit-II

Control Design: Micro programmed control, control memory, address sequencing, micro program example, design of control unit, Hardwired Control: design methods, Multiplier Control Unit, CPU Control unit.

Processor Design: Decimal arithmetic unit – BCD adder, BCD subtraction, decimal arithmetic operations, ALU design, Forms of Parallel processing classification of Parallel structures, Array Processors, Structure of general purpose Multiprocessors.

Unit-III

Memory Organization:

Memory hierarchy, main memory, auxillary memory, associative memory,cache memory, virtual memory, memory management, hardware multiprocessor architectures and their characteristics, interconnection structures, Random access memories: semiconductor RAMS, Serial – access Memories – Memory organization, Main Memory Allocation.

Unit-IV

System Organization:

Pipeline and Vector Processing: Parallel processing, pipelining, arithmetic pipeline, instruction pipeline, RISC pipeline, vector processing, array processors, Input-output Organisation: Peripheral devices, input-output interface, asynchronous data transfer, modes of transfer, priority interrupt,DMA, IOP serial communication.

Text Books:

1. Morris Mano, “Computer System Architecture”, PHI.
2. J.F. Heys, “Computer Organization and Architecture”, TMH.

Reference Books:

1. J. Hennessy and D. Patterson, Computer Architecture A Quantitative Approach, 3rd Ed, Morgan Kaufmann, 2002.

Note: Question paper template will be provided to the paper setter.

ECE-212N	Data Structures Lab					
Lecture	**Tutorial**	**Practical**	**Practical**	**Sessional**	**Total**	**Time**
0	**0**	**3**	**60**	**40**	**100**	**3 Hr.**

Course Outcomes	
CO1	**Students will be able to recall 'C' basics and design basic algorithms using various data structures**
CO2	**Students will be able to design implement various searching and sorting algorithms on arrays.**
CO3	**Students will be able to use pointers to perform various operations of linked lists**
CO4	**Students will be able to understand the basics of trees and Graphs.**

List of Experiments:

1. Write a program to print a 2D array.
2. Write a program to find the factorial of an n^{th} number using recursion.
3. Write a program to print Fibonacci sequence.
4. Using clock() function of time.h header file, compare the timings of linear search and binary search for an 1D array of 1000 elements
5. Compare the timings of the following sorting algorithm
    a. Bubble sort
    b. Selection sort
    c. Insertion sort
6. Implement stacks using arrays for the following user defined functions
    a. Size of stack
    b. Number of elements in the stack
    c. Pop with underflow check
    d. Push with overflow check
7. Implement queues using arrays for the following user defined functions
    a. Size of queue
    b. Number of elements in the queue
    c. Insert an element with overflow check
    d. Delete an element with underflow check
8. Implement linked list for the following user defined functions
    a. Create a node and Insert an element
    b. Delete an element and its node
    c. Find the location of a given value
    d. Print the list in forward or reverse order
9. Traverse a tree and print the elements in
    a. Preorder
    b. Post order
    c. In order
10. Traverse a graph and print the elements using
    a. Depth first search
    b. Breadth first search

ECE-214N	Electronics Measurements and Instruments Lab					
Lecture	**Tutorial**	**Practical**	**Practical**	**Sessional**	**Total**	**Time**
0	**0**	**3**	**60**	**40**	**100**	**3 Hr.**
Course Outcomes						
CO1	**To measure the unknown inductance and capacitance using various AC bridges.**					
CO2	**To measure the unknown frequency using different frequency bridges.**					
CO3	**To understand the concept of caliberation of energy meter and B-H curve of different magnetic materials.**					
CO4	**To understand the concept conversion of voltmeter into ammeter using potentiometer.**					

List of Experiments:

1. To measure the unknown Inductance in terms of capacitance and resistance by using Maxwell's Inductance bridge.
2. To measure unknown Inductance using Hay's bridge.
3. To measure unknown capacitance of small capacitors by using Schering's bridge.
4. To measure 3-phase power with 2-Wattmeter method for balanced and unbalanced bridge.
5. To measure unknown capacitance using De-Sauty's bridge.
6. To measure unknown frequency using Wein's frequency bridge.
7. To measure unknown low resistance by Kelvin's Double bridge.
8. To test the soil resistance using Meggar (Ohm meter).
9. To calibrate Energy meter using standard Energy meter.
10. To plot the B-H curve of different magnetic materials.
11. To calibrate the Voltmeter using Crompton Potentiometer.
12. To convert the Voltmeter into Ammeter using Potentiometer.
13. Insulation testing of cables using Digital Insulation Tester.

ECE-216N	Analog Electronics Lab					
Lecture	**Tutorial**	**Practical**	**Practical**	**Sessional**	**Total**	**Time**
0	**0**	**3**	**60**	**40**	**100**	**3 Hr.**
Course Outcomes						
CO1	**To design and calculate the gain , frequency response etc of the various configuration of transistor amplifier.**					
CO2	**Describe the frequency response of and test the performance of various LC and RC oscillators.**					
CO3	**To understand and design the various applications of 555 timer such as astable and monostable multivibrator.**					

List of Experiments:

1. To Design a simple common emitter (CE) amplifier Circuit using BJT and find its gain and frequency response.

2. To Design a differential amplifier using BJT and calculate its gain and frequency response

3. To design RC coupled Single stage BJT amplifier and determination of the gain ,frequency response, input and output impedances.

4. To design a BJT Emitter follower and determination of the gain, input and output impedances .

5. To design and test the performance of BJT-RC Phase shift Oscillator for $f0 \leq 10$ KHz.

6. To design and test the performance of BJT – Hartley Oscillators for RF range $f0 \geq 100$KHz.

7. To design and test the performance of BJT – Colpitt Oscillators for RF range $f0 \geq 100$KHz.

8. To design an astable multivibrator using 555 timer.

9. To design a monostable multivibrator using 555 timer.

10. To design Schmitt trigger using op-amp and verify its operational characteristics.

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MPC-202N	Energy Studies (B.Tech All Branches Semester III/IV)					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**-**	**-**	**75**	**25**	**100**	**3**
Purpose	**To make the students conversant with the basics concepts and conversion of various form of Energy**					
Course Outcomes						
CO1	**An overview about Energy , Energy Management, Audit and tariffs**					
CO2	**Understand the Layout and working of Conventional Power Plants**					
CO3	**Understand the Layout and working of Non Conventional Power Plants**					
CO4	**To understand the role of Energy in Economic development and Energy Scenario in India**					

UNIT-I

Introduction: Types of energy, Conversion of various forms of energy, Conventional and Non-conventional sources, Need for Non-Conventional Energy based power generation.
Energy Management: General Principles of Energy Management, Energy Management Strategy.
Energy Audit & Tariffs: Need, Types, Methodology and Approach.

UNIT-II

Conventional Energy sources: Selection of site**,** working of Thermal, Hydro, Nuclear and Diesel power plants and their schematic diagrams & their comparative advantages- disadvantages.

UNIT-III

Non Conventional Energy sources: Basicprinciple, site selection and power plant layout of Solar energy, photovoltaic technologies, PV Systems and their components, power plant layout of Wind energy, layout of Bio energy plants ,Geothermal energy plants and tidal energy plants.

UNIT-IV

Energy Scenario: Lay out of power system, Role of Energy in Economic development, energy demand, availability and consumption, Commercial and Non-commercial energy, Indian energy scenario, long term energy scenario, energy pricing, energy sector reforms in India, energy strategy for the future.

Text Books:

1. Energy Studies-Wiley and Dream tech India
2. Soni, Gupta, Bhatnagar: Electrical Power Systems – DhanpatRai& Sons
3. NEDCAP: Non Conventional Energy Guide Lines
4. G.D. Roy :Non conventional energy sources
5. B H Khan :Non Conventional energy resources - McGraw Hill
6. Meinel A B and Meinal M P,Addison :Applie
7. d Solar Energy- Wesley Publications
8. George Sutton :Direct Energy Conversion - McGraw

Bachelor of Technology (Electronics & Communication Engineering)
Scheme of Studies/Examination
Semester V

S. No.	Course No.	Subject	L:T:P	Hours/Week	Examination Schedule (Marks)				Duration of Exam (Hrs)
					Theory	Sessional	Practical	Total	
1	ECE - 301N	Microprocessors & Interfacing	3:1:0	4	75	25	0	100	3
2	HS-303N	Business Intelligence & Enterpreneurship	3:0:0	3	75	25	0	100	3
3	ECE-303N	Antenna & Wave Propgation	3:1:0	4	75	25	0	100	3
4	ECE-305N	VLSI Technology	3:1:0	4	75	25	0	100	3
5	CSE-304N	Essentials of Information Technology	3:0:0	3	75	25	0	100	3
6	ECE-307N	Control Systems Engineering	3:1:0	4	75	25	0	100	3
7	ECE-309N	Microprocessors & Interfacing Lab	0:0:3	3	0	40	60	100	3
8	ECE-311N	Design Automation Lab	0:0:3	3	0	40	60	100	3
9	ECE-313N	Antenna & Wave Propagation Lab	0:0:3	3	0	40	60	100	3
10	ECE-315N*	Personality & Soft Skills Development	2:0:0	2	0	100	0	100	3
		Total		**33**	**450**	**370**	**180**	**1000**	

* The student will be evaluated on the basis of technical **training** seminar and technical writing/reading skills out of 50 marks for each.

Bachelor of Technology (Electronics & Communication Engineering)
Scheme of Studies/Examination
Semester VI

S. No.	Course No.	Subject	L:T:P	Hours/ Week	Examination Schedule (Marks)				Duration of Exam (Hrs)
					Theory	Sessional	Practical	Total	
1	ECE-302N	Digital Signal Processing	3:1:0	4	75	25	0	100	3
2	ECE- 304N	Digital Design Using Verilog	3:1:0	4	75	25	0	100	3
3	ECE-306N	Digital Communication	3:1:0	4	75	25	0	100	3
3	HS-302N	Fundamentals of Management	4:0:0	4	75	25	0	100	3
5	ECE-308N	Computer Communication Network	3:1:0	4	75	25	0	100	3
6	ECE-310N	Digital Signal Processing lab	0:0:3	3	0	40	60	100	3
7	ECE- 312N	Digital Design Using Verilog Lab	0:0:3	3	0	40	60	100	3
8	ECE-314N	Digital Communication lab	0:0:3	3	0	40	60	100	3
9	ECE- 316N*	Personality & Soft Skills Development 2	2:0:0	2	0	100	0	100	3
		Total		**31**	**375**	**345**	**180**	**900**	

* The student will be evaluated on the basis of technical seminar and technical group discussions out of 50 marks for each. All students have to undergo for industrial training after 6^{th} semester which will be evaluated in 7^{th} semester.

ECE -301N	Microprocessor & Interfacing					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3**
Purpose	**To learn the architecture and programming of Intel family microprocessors and its interfacing.**					
Course Outcomes						
CO 1	**To study the Architecture of 8085 microprocessors**					
CO 2	**To learn the architecture 8086 Microprocessor and its interfacing to memories**					
CO 3	**To learn the instruction set of 8086 Microprocessor and assembly language programming of 8086 Microprocessor.**					
CO 4	**To learn interfacing of interrupts, basic I/O and DMA with 8086 Microprocessor**					

Unit-I

8085 CPU Architecture: Evolution of Microprocessor, Introduction to 8085 - 8085 architecture Pin Details, Addressing Modes, Instruction Set and Assembler Directives, Instruction Timing Diagram.

Unit -II

8086 CPU Architecture: 8086 Block diagram; description of data registers, address registers; pointer and index registers, PSW, Queue, BIU and EU. 8086 Pin diagram description, Generating 8086 CLK and reset signals using 8284. WAIT state generation. Microprocessor BUS types and buffering techniques, 8086 minimum mode and maximum mode CPU module. MAIN MEMORY SYSTEM DESIGN: Memory devices, 8086 CPU Read/Write timing diagrams in minimum mode and maximum mode. Address decoding techniques. Interfacing SRAMS; ROMS/PROMS, Interfacing and refreshing DRAMS.

Unit -III

8086 Instruction Set: Instruction formats, addressing modes, Data transfer instructions, string instructions, logical instructions, arithmetic instructions, transfer of control instructions; process control instructions; Assembler directives.

8086 PROGRAMMING TECHNIQUES: Writing assembly Language programs for logical processing, arithmetic processing, timing delays; loops, data conversions.

Unit-IV

Basic I/O Interface: Parallel and Serial I/O Port design and address decoding. Memory mapped I/O Vs Isolated I/O Intel's 8255 and 8251- description and interfacing with 8086. ADCs and DACs, - types, operation and interfacing with 8086. Interfacing Keyboards, alphanumeric displays, multiplexed displays, and stepper motor, optical encoder with 8086.

Interrrupts and DMA: 8086 Interrupt mechanism; interrupt types and interrupt vector table. Applications of interrupts, Intel's 8259. DMA operation. Intel's 8237.

Text Books:

1. Barry B. Brey, "The Intel Microprocessor8086/8088, 80186", Pearson Education, Eighth Edition, 2009
2. D.V. Hall, Microprocessors and Interfacing, McGraw Hill 2nd ed.

Reference Books:

1. Liu, Gibson, "Microcomputer Systems: The 8086/88 Family", 2nd Edition, PHI,2005
2. Kenneth Ayala, "The 8086 Microprocessor: Programming & Interfacing the PC", Cengage Learning, Indian Edition, 2008
3. Kip Irvine, "Assembly language for IBM PC", PHI, 2nd Edition, 1993
4. Peter Abel, "Assembly language programming", Pearson Edu,5th Edition,2002
5. Uffenback, "The 8086 Family Design" PHI, 2nd Edition.
6. Walter A Triebel and Avtar Singh; The 8088 and 8086 Microprocessors, Programming, Interfacing, Software, Hardware and Applications, Fourth Edition, Pearson Education.

Note: Question paper template will be provided to the paper setter.

HS-303N	Business Intelligence & Entrepreneurship					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**0**	**0**	**75**	**25**	**100**	**3**
Course Outcomes						
CO 1	**Students will be able understand who the entrepreneurs are and what competences needed to become an Entrepreneur**					
CO 2	**Students will be able understand insights into the management, opportunity search, identification of a Product; market feasibility studies; project finalization etc. required for small business enterprises.**					
CO 3	**Students can be able to write a report and do oral presentation on the topics such as product identification, business idea, export marketing etc.**					
CO 4	**Students be able to know the different financial and other assistance available for the establishing small industrial units.**					

Unit -I

Entrepreneurship: Concept and Definitions; Entrepreneurship and Economic Development; Classification and Types of Entrepreneurs; Entrepreneurial Competencies; Factor Affecting Entrepreneurial Growth – Economic, Non-Economic Factors; EDP Programmes; Entrepreneurial Training; Traits/Qualities of an Entrepreneurs; Entrepreneur; Manager Vs. Entrepreneur.

Unit -II

Opportunity / Identification and Product Selection: Entrepreneurial Opportunity Search &Identification; Criteria to Select a Product; Conducting Feasibility Studies; Project Finalization; Sources of Information.

Unit -III

Small Enterprises and Enterprise Launching Formalities : Definition of Small Scale; Rationale; Objective; Scope; Role of SSI in Economic Development of India; SSI; Registration; NOC from Pollution Board; Machinery and Equipment Selection; Project Report Preparation; Specimen of Project Report; Project Planning and Scheduling using Networking Techniques of PERT / CPM; Methods of Project Appraisal.

Unit -IV

Role of Support Institutions and Management of Small Business : Director of Industries; DIC; SIDO; SIDBI; Small Industries Development Corporation (SIDC); SISI; NSIC; NISBUD; State Financial Corporation SIC; Marketing Management; Production Management; Finance Management; Human Resource Management; Export Marketing; Case Studies-At least one in whole course.

Text Books:

1. Small-Scale Industries and Entrepreneurship. Himalaya Publishing House, Delhi -Desai, Vasant, 2003.
2. Entrepreneurship Management -Cynthia, Kaulgud, Aruna, Vikas Publishing House, Delhi, 2003.
3. Entrepreneurship Ideas in Action- L. Greene, Thomson Asia Pvt. Ltd., Singapore, 2004.

Note: Question paper template will be provided to the paper setter.

ECE-303N	Antenna & Wave Propagation					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the performance parameters of antenna, methods of analysis of antenna, antenna used for various applications and different ways of propagating the signal.**					
Course Outcomes						
CO1	**To understand the performance parameters of antenna.**					
CO2	**Understanding the mechanism of calculating the radiated fields of antenna and to calculate the radiated fields of some common Antennas.**					
CO3	**To understand the requirements, principals, and structures for an antenna to be broadband.**					
CO4	**To understand the different ways of signal propagation.**					

Unit – I

Basic Principles and Definitions: Retarded vector and scalar potentials. Radiation and induction fields. Radiation from elementary dipole (Hertzian dipole, short dipole, Linear current distribution), half wave dipole, Antenna parameters : Radiation resistance, Radiation pattern, Beam width, Gain, Directivity, Effective height, Effective aperture, Bandwidth and Antenna Temperature.

Unit – II

Radiating Wire Structures and Antenna Arrays: Folded dipole , Monopole, Biconical Antenna, Loop Antenna, Helical Antenna. Principle of pattern multiplication, Broadside arrays, Endfire arrays, Array pattern synthesis, Uniform Array, Binomial Array, Chebyshev Array, Antennas for receiving and transmitting TV Signals e.g. Yagi-Uda and Turnstile Antennas.

Unit – III

Broadband and Frequency Independent Antennas : Broadband Antennas. The frequency independent concept : Rumsey's principle, Frequency independent planar log spiral antenna, Frequency independent conical spiral antenna and Log periodic antenna.

Patch Antenna: Advantages and basic Configurations of Patch antenna. Different feeding techniques of Patch antenna. Method to analyze Patch antenna

Unit – IV

Propagation of Radio Waves : Different modes of propagation, Ground waves, Space waves, Surface waves and Tropospheric waves, Ionosphere, Wave propagation in the ionosphere, critical frequency, Maximum Usable Frequency (MUF), Skip distance, Virtual height, Radio noise of terrestrial and extra terrestrial origin. Multipath fading of radio waves.

Text Books:

1. A.R.Harish, M.Sachidananda, Antenna and Wave Propagation, Oxford University Press.
2. G.S.N.Raju, Antenna and Wave Propagation, Pearson.

Reference Books:

1. ConstantineA.Balanis, Antenna Theory Analysis and Design, John wiley & Sons.
2. John D. Kraus, Ronald JMarhefka, Ahmad S Khan, Antennas for all applications, McGraw Hill.

Note: Question paper template will be provided to the paper setter.

ECE-305N	VLSI Technology					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hrs**
Course Outcomes						
CO1	**Students will be able estimate oxide thickness, growth rate, etch rate, deposition rate, and perform pattern etching etc. using knowledge of mathematics, science, engineering and practices.**					
CO2	**Students can design and conduct experiments such as oxidation, metallization and analyze growth / deposition rate, thickness etc.**					
CO3	**Shall be able to understand system, design such as CVD reactor, PVD chamber etc.**					
CO4	**Understanding of professional and ethical responsibility while working in clean rooms.**					
CO5	**Communicate effectively: Students can write an engineering report on the topic assigned and give an effective oral presentation.**					

Unit -I

Clean Room Technology - Clean room concept – Growth of single crystal Si, surface contamination, cleaning & etching, cleaning of p-type & n-type Si-wafer by solvent method & RCA cleaning, Fabrication process of p-n diode.

Unit -II

Oxidation – Growth mechanism and kinetic oxidation, oxidation techniques and systems, oxide properties, oxide induced defects, charactrisation of oxide films, Use of thermal oxide and CVD oxide; growth and properties of dry and wet oxide, dopant distribution, oxide quality, Isolation Techniques with reference to VLSI circuits.

Unit -III

Solid State Diffusion – Fick's equation, atomic diffusion mechanisms, measurement techniques, diffusion in polysilicon and silicon di-oxide diffusion systems. Ion implantation – Range theory, Equipments, annealing, shallow junction, high energy implementation.

Unit -IV

Mask making, E-beam writing, Lithography – Optical lithography, Lift-off technique, Some Advanced lithographic techniques, Physical Vapour Deposition – APCVD, Plasma CVD, MOCVD. Metallisation - Different types of metallisation, uses & desired properties, Fabrication process of Schottky diodes, VLSI Process integration and NMOS fabrication process.

Text Book:

1. Semiconductor Devices Physics and Technology, Author: Sze, S.M.; Notes: Wiley, 1985
2. VLSI Technology, Author: Sze, S.M.; Notes: Wiley, 1985;
3. An Introduction to Semiconductor Microtechnology, Author: Morgan, D.V., and Board;
4. The National Technology Roadmap for Semiconductors industry.

Note: Question paper template will be provided to the paper setter.

CSE-304N		Essentials of Information Technology					
Lecture	**Tutorial**	**Practical**	**Credit**	**Theory**	**Sessional**	**Total**	**Time**
3	**0**	**-**	**3.0**	**75**	**25**	**100**	**3 Hrs.**
Purpose	**To introduce the well informed design concepts of Object Oriented Programming using Java and RDBMS**						
	Course Outcomes (COs)						
CO1	Solve Problems using various efficient and reliable Algorithms.						
CO2	Design and Study the basic concepts in Java.						
CO3	Document and implement Object oriented paradigms and design models in Java.						
CO4	Design and study RDBMS Modeling and its program implementation.						

Unit I:

Problem Solving Techniques: Introduction to Problem Solving, Introduction to Algorithms and Flowchart, Searching algorithms: Linear search, Binary search and Sorting algorithms: Insertion and Selection sort, Basic Data Structures: Stack, and Linear Queue.

Unit II:

Programming Basics: Identifiers, Variables, Data Types, Operators, Control Structures: Loop, If else, Nested If, Switch Statement, Arrays, Strings,. Object Oriented Concepts : Class & Object, Operator, Instance Variables & Methods, Access Specifiers, Reference Variables: This, Super, Parameter Passing Techniques, Constructors, Static, and Command Line Arguments

Unit III:

Relationships: Inheritance, Types of Inheritance, Static Polymorphism: Method Overloading, Constructor Overloading, Method Overriding, Abstract, Interface, Introduction to Packages.

Unit IV:

RDBMS- Data Processing, Database Technology, Data Models, Data Independence, ER Modeling Concept, ER-notations, Converting ER Diagram into Relational Schema, Definition of Keys: Primary key, Foreign key, Unique Key.

SQL: DDL Statements, DML Statements, DCL Statements, Joins, Sub queries, Views.

Books on Java

1. Java: The Complete Reference, Seventh Edition. Herbert Schildt,McGraw –Hill Education.
2. Programming with Java 3e A Primer, E Balagurusamy, McGraw Hill Education.
3. Introduction to Java Programming, K. Somasundaram , Jaico Publishing House, 1st edition.

Books on RDBMS, Oracle, MYSQL

1. Fundamentals of Database Systems, with E-book (3rd Edition) by Shamkant B. Navathe, Ramez Elmasri, Published by Addison Wesley Longman , January 15th , 2002.
2. MySQL by Paul DuBois Published by New Riders.
3. Murach's MySQL Paperback, Joel Murach , Published by Shroff/Murach, 2012.
4. SQL: The Complete Reference , James R. Groff, Paul N. Weinberg, Published by McGraw-Hill Companies, March 1999.
5. Schaum's Outline of Fundamentals of Relational Databases, Ramon Mata-Toledo, Published by McGraw-Hill November 15th 2000.

ECE-307N	Control System Engineering					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hrs**
Purpose	**The purpose of this course is to create awareness about the various types of control systems with the techniques to analyze them so that the learner is able to mathematically design and evaluate the conditions for which a control system can provide stable output with improved performance.**					
Course Outcomes						
CO1	**Learner will be able to design and simplify the mathematical and graphical models of a control system through block diagram and signal flow graph method.**					
CO2	**Learner can evaluate the conditions for which a system can work under stable conditions in time domain.**					
CO3	**Learner will know about easier graphically methods to evaluate the conditions of stability in frequency domain.**					
CO4	**Learner will able to apply the compensation technique using state variable approach to covert an unstable system into a stable system under certain conditions.**					

Unit-I

Introduction: The control system-open loop & closed loop, servomechanism, stepper motor. Mathematical Models of Physical Systems: Differential equation of physical systems, transfer function, block diagram algebra, signal flow-graphs, Mason's formula & its application. Feedback Characteristics of Control Systems: Feedback and non-feedback systems, Effects of feedback on sensitivity (to parameter variations), stability, overall gain etc.

Unit-II

Time Response Analysis: Standard test signals, time response of first order and second order systems, steady-state errors and error constants, design specification of second-order- systems. Stability:The concept of stability ,necessary conditions for stability, Hurwitz stability criterion, Routh stability criterion, Relative stability analysis. The Root Locus Technique: The Root locus concept, construction /development of root loci for various systems, stability considerations.

Unit-III

Frequency Response & Stability Analysis: Correlation between time and frequency response, Polar Plots, Nyquist plots, Bode Plots, Nyquist stability criterion, Gain margin & Phase margin, relative stability using Nyquist Criterion, frequency response specifications.

UNIT-IV

Compensation of Control Systems: Necessity of compensation, Phase lag compensation, phase lead compensation, phase lag lead compensation, feedback compensation. State Variable Analysis: Concept of state,state variable and state model, state models for linear continuous time systems, diagonalization solution of state equations, concept of controllability and observability.

Text Book:

Control System Engg.: I. J. Nagrath & M.Gopal; New Age India.

Reference Books:

1. Automatic Control Systems: B.C. Kuo; PHI.
2. Modern Control Engg: K. Ogata; PHI.
3. Control Systems: Principles & Designing : Madan Gopal; TMH.

Note: Question paper template will be provided to the paper setter.

ECE-309N	Microprocessors & Interfacing Lab					
Lecture	**Tutorial**	**Practical**	**Sessional**	**Practical**	**Total**	**Time**
0	**0**	**3**	**40**	**60**	**100**	**3 Hour**
Purpose	**Write the efficient Assembly Language Program for different problem statements and implement different system interfacing.**					
Course Outcomes						
CO 1	**Understanding different steps to develop program such as Problem definition, Analysis, Design of logic, Coding, Testing, Maintenance (Modifications, error corrections, making changes etc.)**					
CO 2	**To be able to apply different logics to solve given problem.**					
CO 3	**To be able to write program using different implementations for the same problem**					
CO 4	**Use of programming language constructs in program implementation**					

Before starting with the experiments, teacher should make the students conversant with the following essential theoretical concepts.

A. i) Programming Model of Intel's 8086.
   ii) Addressing Modes of Intel's 8086.
   iii) struction formats of Intel's 8086
B. Instruction set of Intel's 8086.
C. Assembler (TASM), and Debugger.

List of Experiments: (Verification of atleast 3 experiments may also be done using TASM)

1. a) Familiarization with 8086 Trainer Kit.
   b) Familiarization with Digital I/O, ADC and DAC Cards.
   c) Familiarization with Turbo Assembler and Debugger S/Ws

2. Write a program to arrange block of data in
   i) ascending and (ii) descending order.

3. Write a program to find out any power of a number such that $Z = X^N$. Where N is programmable and X is unsigned number.

4. Write a program to generate.
   i) Sine Waveform (ii) Ramp Waveform (iii) Triangular Waveform Using DAC Card.

5. Write a program to measure frequency/Time period of the following functions.
   i) Sine Waveform (ii) Square Waveform (iii) Triangular Waveform using ADC Card.

6. Write a program to increase, decrease the speed of a stepper motor and reverse its direction of rotation using stepper motor controller card.

7. Write a programmable delay routine to cause a minimum delay = 2MS and a maximum delay = 20 minutes in the increments of 2 MS
8. Write a program that takes any two numbers as Input from the user through the input device (Keyboard) & Prints their sum on the standard output device (Screen).

9. Write a program that takes any two numbers as Input from the user through the input device (Keyboard) & Prints their sum on the standard output device (Screen) by giving appropriate messages to the user.

10. Write a program that initializes 100 positions in an array and loads them with zero.

11. Write a program that prints a Blinking character in the middle of the screen.

12. Write a program that accepts a number from the user through the input device (Keyboard), calculates its factorial and prints the result on the screen.

ECE-311N	Design Automation Lab					
Lecture	**Tutorial**	**Practical**	**Sessional**	**Practical**	**Total**	**Time**
0	**0**	**3**	**40**	**60**	**100**	**3 Hr.**
Course Outcomes						
CO1	To familiarize the students with circuit simulation tool (Multisim).					
CO2	Describe the Digital and analog aspects of the simulation tool.					
CO3	To familiarize with the programming aspects of the virtual microcontrollers using inbuilt compiler and debugger.					
CO4	To familiarize with the hardware associated with the simulating tool (NI-ELVIS).					

List of Experiments:

1. Introduction to Multisim and associated GUI (Graphical User Interface) modules.
2. To design and study the volt-ampere characteristics of PN-Diode.
3. To design a virtual bridge rectifier.
4. To design a virtual Schmitt Trigger using Operational Amplifier.
5. To design a virtual low pass filter and study its phase and frequency response.
6. To design a virtual monostable multivibrator using 555 timer.
7. To design a virtual Weighted Average DAC.
8. To program and simulate the virtual MCU (Micro-Controller Unit) for LCD display.
9. Introduction to NI-ELVIS board.
10. To design on board circuit for Differentiator and Integrator and taking the output on screen.
11. To design on board circuit for Shift Register using associated peripherals and considering the output on screen.
12. To design the virtual single toned amplitude modulation circuit and analyze the spectrum of the output.

ECE-313N	Antenna & Wave Propagation Lab					
Lecture	**Tutorial**	**Practical**	**Sessional**	**Practical**	**Total**	**Time**
0	**0**	**3**	**40**	**60**	**100**	**3 Hr.**
Course Outcomes						
CO1	**To understand the basic concepts of HFSS or any other simulation software used for 3D simulations**					
CO2	**To design various types of antenna**					
CO3	**To analyze various types of antennas**					
CO4	**To Find performance parameters of antenna**					

List of Experiments:

1. To study and analyze the characteristic of monopole antenna.
2. To study and analyze the characteristic of Dipole antenna.
3. To study and analyze the characteristic of quarter wave Dipole.
4. To study and analyze the characteristic of Turnstile antenna.
5. To study and analyze the characteristic of different Patch antenna.
6. To study and analyze the characteristic of square loop antenna.
7. To study and analyze the characteristic of array of square loop antenna.
8. To study and analyze the characteristic of rectangular Waveguide.
9. To study and analyze the characteristic of circular Waveguide.
10. To study and analyze the characteristic of circulator.

ECE-302N	Digital Signal Processing					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the basic concepts of Digital Signal Processing, Z-Transform, Fourier transform Designing of FIR and IIR Filters.**					
Course Outcomes						
CO1	**Introduce to Z-Transform, Fourier Transform and their properties.**					
CO2	**To understand the basic concepts of Frequency Domain sampling and implementation of Discrete Time Systems.**					
CO3	**Familiarization with the Design of FIR Filters.**					
CO4	**Familiarization with the Design of IIR Filters.**					

Unit-I

Discrete Transforms: Z- transform and its properties, Inversion of Z-transform, One sided Z-transform and solution of differential equations. Analysis of LTI systems in Z-domain, causality, stability, schur-cohn stability test, relationship between Z-transform and Fourier transform.

Frequency Selective Filters: All pass filters, minimum-phase, maximum-phase and mixed-phase systems, Goertzel algorithm, Chirp Z-transform, applications of Z-Transform.

Unit-II

Frequency Domain Sampling and DFT: Properties of DFT, Linear filtering using DFT, Frequency analysis of signals using DFT, radix 2, radix-4, computation of DFT of real sequences.

Implementation of Discrete Time Systems: Direct form, cascade form, frequency sampling and lattice structures for FIR systems. Direct forms, transposed form, cascade form parallel form. Lattice and lattice ladder structures for IIR systems.

Unit-III

Design of FIR Filters : Characteristics of practical frequency selective filters. Filters design specifications peak pass band ripple, minimum stop band attenuation. Four types of FIR filters, alternation theorem.

Design of FIR filters using windows, Kaiser window method comparison of design methods for FIR filters, Gibbs phenomenon, design of FIR filters by frequency sampling method, design of optimum equiripple FIR filters.

Unit-IV

Design of IIR Filters: Design of IIR filters from analog filters, Design by approximation of derivatives, Impulse Invariance Method, Bilinear Transformation Method, Least Square Methods.

Characteristics of Butterworth, Chebyshev and Elliptical analog filters, Design of IIR filters, Frequency transformation, , design of IIR filters in frequency domain.

Text Books:

John G. Proakis, Digital Signal Processing, PHI.

Reference Books:

1. S. K. Mitra, Digital Signal Processing , TMH
2. Rabiner and Gold, Digital Signal Processing, PHI
3. Salivahan, Digital Signal Processing , TMH
4. Digital Signal Processing: Alon V. Oppenhelm;PHI

Note: Question paper template will be provided to the paper setter.

ECE-304N	Digital Design Using Verilog					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the conventions of the Verilog HDL programming, algorithmic levels of abstraction for modeling digital hardware systems, Finite State Machines, the concept of test-benches to create testing behavioral environments for simulation based verification.**					
Course Outcomes						
CO1	**To understand the constructs and conventions of the Verilog HDL programming.**					
CO2	**To understand the structural, register-transfer level (RTL), and algorithmic levels of abstraction for modeling digital hardware systems.**					
CO3	**To design and modeling of combinational and sequential digital systems (Finite State Machines).**					
CO4	**To apply the concept of test-benches to create testing behavioral environments for simulation based verification.**					

Unit-I

Introduction: Introduction, conventional approach to digital design, VLSI design, ASIC design flow, Role of HDL.Conventional Data flow, ASIC data flow, Verilog as HDL, Levels of Design Description, Concurrency, Simulation and Synthesis, Functional Verification, System Tasks, Programming Language Interface (PLI), Module, Simulation and Synthesis Tools, Test Benches.

Language constructs and conventions: Introduction, Keywords, Identifiers, White Space Characters, Comments, Numbers, Strings, Logic Values, Strengths, Data Types, Scalars and Vectors, Parameters, Memory, Operators, System Tasks.

Unit-II

Gate level modeling: Introduction, AND Gate Primitive, Module Structure, Other Gate Primitives, Illustrative Examples, Tri-State Gates, Array of Instances of Primitives, Additional Examples, Design of Flip-flops with Gate Primitives, Delays, Strengths and Contention Resolution, Net Types, Design of Basic Circuits.

Behavioral modeling: Introduction, Operations and Assignments, Functional Bifurcation, Initial Construct, Always Construct, Examples, Assignments with Delays, Wait construct, Multiple Always Blocks, Designs at Behavioral Level, Blocking and Non-blocking Assignments, The case statement, Simulation Flow, if and if-else constructs, assign-deassign construct, repeat construct, for loop, the disable construct, while loop, forever loop, parallel blocks, force-release construct, Event.

Unit-III

Modeling at data flow level: Introduction, Continuous Assignment Structures, Delays and Continuous Assignments, Assignment to Vectors, Operators, Additional Examples.

Switch level modeling: Introduction, Basic Transistor Switches, CMOS Switch, Bi-directional Gates, Time Delays with Switch Primitives, Instantiations with Strengths and Delays, Strength Contention with Trireg Nets.

Unit-IV

Functions, tasks, and user defined primitives: Introduction, Function, Tasks, User- Defined Primitives (UDP), FSM Design (Moore and Mealy Machines).

System tasks, functions, and compiler directives: Introduction, Parameters, Path Delays, Module Parameters, System Tasks and Functions, File-Based Tasks and Functions, Compiler Directives, Hierarchical Access, General Observations.

Text Books:

1. T. R. Padmanabhan, B. Bala Tripura Sundari (2004), Design through Verilog HDL, Wiley & Sons Education, IEEE Press, USA.

2. J. Bhaskar (2003), A Verilog Primier, 2nd edition, BS Publications, India.

Reference Books:

1. Samir Palnitkar (2013), Verilog HDL, Pearson India.
2. Stephen. Brown, ZvonkoVranesic (2005), Fundamentals of Logic Design with Verilog, Tata McGraw Hill, India.
3. Charles H. Roth (2004), Digital Systems Design using VHDL, Jr. Thomson Publications, India.

Note: Question paper template will be provided to the paper setter.

ECE-306N	Digital Communication					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**
Course Outcomes						
CO1	**Student will be able to perform coding of various sources.**					
CO2	**Student will be able to analyze various basic digital pulse modulation schemes.**					
CO3	**Student will be able to understand base band pulse transmission.**					
CO4	**Student will be able to analyze various basic digital modulation techniques.**					

Unit – I

Information Theory: Introduction, Entropy, Huffman Coding, Channel Capacity,Channel Coding, Linear Block Codes, Matrix Description, Syndrome Decoding, Hamming Code, Cyclic Code,Convolution Code generation and Viterbi decoding.

Unit – II

Pulse Modulation System: Model of digital communication systems, Sampling theorem for baseband and bandpass signals: natural sampling, Flat top sampling, Signal recovery & holding, Quantization of signal, Quantization error, Source coding & companding, Pulse code modulation (PCM), Noise in PCM systems, Differential pulse code modulation (DPCM), Adaptive pulse code modulation (ADPCM), Delta modulation (DM), Comparison of PCM, DPCM and DM, Adaptive delta modulation, Quantization noise, Time division multiplexed systems (T & E type systems), Calculation of O/P signal power, The effect of thermal noise, O/P signal to noise ratio in PCM, Quantization noise in delta modulation, The O/P signal to quantization noise ratio in delta modulation, O/P signal to noise ratio in delta modulation

Unit – III

Base Band Pulse Transmission: Matched filter and its properties average probability of symbol error in binary enclosed PCM receiver, Intersymbol interference, Nyquist criterion for distortionless base band binary transmission, ideal Nyquist channel raised cosine spectrum, correlative level coding Duo binary signalling, tapped delay line equalization, adaptive equalization, LMS algorithm, Eye pattern.

Unit – IV

Digital Pass Band Transmission: Pass band transmission model; gram Schmidt orthogonalization procedure, geometric Interpretation of signals, Response of bank of correlaters to noise input, detection of known signal in noise, Hierarchy of digital modulation techniques, BPSK, DPSK, DEPSK, QPSK, systems; ASK, FSK, QASK, Many FSK, MSK, Many QAM, Signal space diagram and spectra of the above systems, effect of intersymbol interference, bit symbol error probabilities, synchronization.

Text Books:

1. Proakis John G., Digital Communication System, McGraw, (2000) 4th ed.
2. Simon Haylein, Digital Communication Systems, Wiley India edition, (2009) 2nd ed.
3. Information Theory,Coding and Cryptography, Ranjan Bose, TMH, II edition, 2007

Reference Books :

1. Lathi B. P., Modern Analog and Digital Communication, , Oxford University Press, (1998) 3rd ed.
2. Taub & Schilling, Principles of Communication Systems, McGraw Hill Publications, (1998) 2nd ed.
3. Simon Haykin, Communication Systems, John Wiley Publication, 3rd ed.

4. Sklar, Digital Communications, Prentice Hall-PTR, (2001) 2nd ed.
5. R N Mutagi, Digital Communication: Theory, Techniques and Applications, Oxford University Press, 2nd ed.

Note: Question paper template will be provided to the paper setter.

HS-302N	Fundamentals of Management					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
4	**0**	**0**	**75**	**25**	**100**	**3 Hrs.**
Purpose	**To make the students conversant with the basics concepts in management thereby leading to nurturing their managerial skills**					
Course Outcomes						
CO1	**An overview about management as a discipline and its evolution**					
CO2	**Understand the concept and importance of planning and organizing in an organization**					
CO3	**Enabling the students to know about the importance of hiring and guiding the workforce by understanding the concept of leadership and communication in detail**					
CO4	**To understand the concept and techniques of controlling and new trends in management**					

Unit-I

Introduction to Management: Meaning, Definition, nature, importance & Functions, Management as Art, Science & Profession- Management as social System, Concepts of management-Administration

Evolution of Management Thought: Development of Management Thought- Scientific management, Administrative Theory of Management, Bureaucratic Organization, Behavioral approach (Neo Classical Theory): Human Relations Movement; Behavioral Science approach; Modern approach to management – Systems approach and contingency approach.

Unit-II

Planning: nature, purpose and functions, types of plans, planning process, Strategies and Policies: Concept of Corporate Strategy, formulation of strategy, Types of strategies, Management by objectives (MBO), SWOT analysis, Types of policies, principles of formulation of policies

Organizing: nature, importance, process, organization structure: Line and Staff organization, Delegation of Authority and responsibility, Centralization and Decentralization, Decision Making Process , Decision Making Models, Departmentalization: Concept and Types (Project and Matrix), formal & informal organizations.

Unit-III

Staffing: concept, process, features; manpower planning; Job Analysis: concept and process; Recruitment and selection: concept, process, sources of recruitment; performance appraisal, training and development.

Directing: Communication- nature, process, formal and informal, barriers to Effective Communication, Theories of motivation-Maslow, Herzberg, McGregor ; Leadership – concept and theories, Managerial Grid, Situational Leadership. Transactional and Transformational Leadership.

Unit-IV

Controlling: concept, process, types, barriers to controlling, controlling Techniques: budgetary control, Return on investment, Management information system-MIS , TQM-Total Quality Management, Network Analysis- PERT and CPM.

Recent Trends in Management: Social Responsibility of Management–Management of Crisis, Total Quality Management, Stress Management, ., Concept of Corporate Social Responsibility (CSR) and business ethics. Functional aspects of business: Conceptual framework of functional areas of management- Finance; Marketing and Human Resources.

Text Books

1. Management Concepts - Robbins, S.P; Pearson Education India
2. Principles of Management - Koontz &O'Donnel; (McGraw Hill)

Reference Books

1. Business Organization and Management – Basu ; Tata McGraw Hill
2. Management and OB-- Mullins; Pearson Education
3. Essentials of Management – Koontz, Tata McGraw-Hill
4. Management Theory and Practice – Gupta, C.B; Sultan Chand and Sons, new Delhi
5. Prasad, Lallan and S.S. Gulshan. Management Principles and Practices. S. Chand & Co. Ltd., New Delhi.
6. Chhabra, T.N. Principles and Practice of Management. DhanpatRai& Co., Delhi.
7. Organizational behavior – Robins Stephen P; PHI.

Note: Question paper template will be provided to the paper setter.

ECE-308N	Computer Communication Networks					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the concepts of basic computer networks used in communication. Also familiarize the students with the various layers of OSI and TCP/IP model.**					
Course Outcomes						
CO1	**To understand the concept of basics of computer networks and physical layer& media.**					
CO2	**To understand the concept and processes of data link layer and medium access sublayer.**					
CO3	**To familiarize with the concept and design issues of network, transport & session layer.**					
CO4	**To familiarize with the concept and protocols of presentation and application layer.**					

Unit – I

Introduction:

Introduction to Computer Networks, Protocols and standards, Network Models: The OSI Model, Layers in the OSI Model, TCP/IP protocol suite, Introduction to addressing.

Physical Layer and Media:

Analog and Digital (signals & data), Transmission media : Guided &Unguided, The Telephone System, Narrowband ISDN, Broadband ISDN and ATM.

Unit -II

The Data Link Layer:

Data Link Layer Design issues, Error Detection & correction, Data link control: Framing, Flow & Error control, Noiseless channels, Noisy channels, HDLC, Point to Point protocols.

The Medium Access Sublayer:

Aloha Protocols, LAN Protocols: wired LAN,s ,Wireless LAN, Networks, Satellite Networks.

Unit -III

Network Layer:

Design issues, IPv4 addresses, IPv6 addresses, internetworking,IPv4, IPv6 ,congestion control algorithms.

Transport & Session Layer:

Protocol design issues, Process to process delivery, UDP, TCP connection Management, remote procedure calls.

Unit – IV

Presentation Layer:

Design issues, abstract Syntax notation, data compression technique, cryptography.

Application Layer:

Design issues, file transfer, access and and management, electronic mail, virtual terminals, WWW & HTTP .

Text Books:

1. Forouzan B.A, Data Communications and Networking, Tata-Mc-Graw Hill.
2. Tanenbaum A.S, Computer Networks, PHI.

Reference Books:

1. Stallings W, Data and Computer Communications, PHI.
2. Leon –Garcia, Computer Networks, Mc Graw Hill

Note: Question paper template will be provided to the paper setter.

ECE-310N	Digital Signal Processing Lab					
Lecture	**Tutorial**	**Practical**	**Sessional**	**Practical**	**Total**	**Time**
0	**0**	**3**	**40**	**60**	**100**	**3 Hr.**
Course Outcomes						
CO1	**Introduction to MATLAB.**					
CO2	**Study of different function and signals of DSP.**					
CO3	**Study of DFT and DTFT with their properties.**					
CO4	**Study of z-transform and its properties.**					

List of Experiments:

1. Introduction to MATLAB.
2. Write a program to plot the Sine wave, cosine wave and Tangent wave.
3. Write a program to plot the following functions: a)impulse function b)unit step c)unit ramp d) exponential e) sinusoidal
4. Write a program to plot the convolution and multiplication of two signals.
5. Define a function to compute DTFT of a finite length signal. Plot the magnitude and phase plots using subplots.
6. Verify the Symmetry, time shifting and modulating properties of DTFT with a rectangular pulse.
7. Study the aliasing effect by using a Sinusoidal Signal. Show the plots of' continuous time Signal. Sampled Signal and reconstructed signals by using subplot.
8. Write a program to plot real, imaginary phase and magnitude of exponential function.
9. Study different window functions available in signal processing.
10. Verify the properties of Discrete Fourier Transform (DFT).
11. Write a program to find the convolution of two sequences using in built convolution function.
12. Write a program to study the frequency shift property of DTFT.
13. Write a program to study circular shift property of DTFT.
14. Write a program to study scaling property of DFT.
15. Write a program to study the sampling theorem of a continuous time signal.
16. Write a program to study the Z-Transform.

17. Write a program to study the various Properties of Z-Transform.

Note: At least 10 experiments are to be performed with atleast 7 from above list, remaining 3 may either be performed from the above list or designed & set by concerned institution as per the scope of the syllabus.

ECE-312N	Digital Design Using Verilog Lab					
Lecture	**Tutorial**	**Practical**	**Sessional**	**Practical**	**Total**	**Time**
0	**0**	**3**	**40**	**60**	**100**	**3 Hr.**
Purpose	**To familiarize the students with the basics of design of conventional electronic circuits, the features of Verilog HDL, design circuits using gate level modeling.**					
Course Outcomes						
CO1	**To describe, design, simulate, and synthesize circuits using the Verilog hardware description language.**					
CO2	**To design and modeling of combinational and sequential digital systems.**					
CO3	**To develop program codes for synthesis-friendly combinational and sequential logic circuits.**					
CO4	**To understand the advanced features of Verilog HDL and be able to write optimized codes for complex systems.**					

List of Experiments:

1. Write a Program to implement logic gates.
2. Write a Program to implement half-adder.
3. Write a Program to implement full-adder.
4. Write a Program to implement 4 bit addition/subtraction.
5. Write a Program to implement a 3:8 decoder.
6. Write a Program to implement an 8:1 multiplexer.
7. Write a Program to implement a 1:8 demultiplexer.
8. Write a Program to implement 4 bit comparator.
9. Write a Program to implement Mod-10 up counter.
10. Write a program to perform serial to parallel transfer of 4 bit binary number.
11. Write a program to perform parallel to serial transfer of 4 bit binary number.
12. Write a program to implementa8 bit ALU containing 4 arithmetic & 4 logic operations.

ECE-314N	Digital Communication Lab					
Lecture	**Tutorial**	**Practical**	**Sessional**	**Practical**	**Total**	**Time**
0	**0**	**3**	**40**	**60**	**100**	**3 Hr.**
Course Outcomes						
CO1	**Student will be able to perform coding techniques.**					
CO2	**Student will be able to understand Optical fibre communication process**					
CO3	**Student will be able to understand base band pulse transmission.**					
CO4	**Student will be able to analyze various basic digital modulation techniques.**					

List of Experiments:

1. To Study ASK
2. To Study PSK
3. To Study FSK
4. To Study Balanced Modulator & Demodulator
5. To Study PCM
6. Setting up a Fiber Optic Analog Link
7. Setting up a Fiber Optic Digital Link
8. Losses in Optical Fiber
9. Measurement of Numerical Aperture
10. Time Division multiplexing of signals.

Note: At least 10 experiments are to be performed with atleast 7 from above list, remaining 3 may either be performed from the above list or designed & set by concerned institution as per the scope of the syllabus.

BachelorofTechnology(Electronics&CommunicationEngineering)
Scheme ofStudies/Examination
SemesterVII

S.No.	CourseNo.	Subject	L:T:P	Hours/Week	ExaminationSchedule(Marks)				Duration ofExam(Hrs)
					Theory	Sessionals	Practical	Total	
1	ECE-401N	Microcontroller & Embedded Systems Design	3:0:0	3	75	25	0	100	3
2	ECE-403N	Digital Image Processing	4:0:0	4	75	25	0	100	3
3	ECE-405N	Power Electronics	3:0:0	3	75	25	0	100	3
4		Core Elective -I**	3:0:0	3	75	25	0	100	3
5		Core Elective -II**	3:0:0	3	75	25	0	100	3
6	ECE-407N	Microcontroller & Embedded Systems Design Lab	0:0:3	3	0	40	60	100	3
7	ECE-409N	Digital Image Processing Lab	0:0:3	3	0	40	60	100	3
8	ECE-411N***	Project-1	0:0:10	10	0	100	100	200	3
9	ECE-413N*	Industrial Training Viva	2:0:0	2	0	100	0	100	
		Total		**34**	**375**	**405**	**220**	**1000**	

**Theperformanceofthestudentwillbeevaluatedbythe technical training (undertaken after 6th semester) seminar and the report submitted by the student which should also include theIndustrial/Researchproblems faced&suggested solutions.*

*** Thestudents shouldselecttwodepartmentalelectivessubjectsfrom thelist ofcoreelectivesubjects.*

****Theprojectshouldbeinitiatedbythestudentinthe7thsemesterbeginningandwillbeevaluatedintheendofthesemesteronthebasisof a presentationand report submitted to the department.*

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BachelorofTechnology(Electronics&CommunicationEngineering)

Scheme ofStudies/Examination

SemesterVIII

S.No.	CourseNo.	Subject	L:T:P	Hours/Week	ExaminationSchedule(Marks)				Duration of Exam(Hrs)
					Theory	Sessionals	Practical	Total	
1	ECE-402N	Wireless & MobileCommunication	4:0:0	4	75	25	0	100	3
2	ECE- 404N	Microwave Engineering	3:0:0	3	75	25	0	100	3
3		Core Elective -III**	3:0:0	3	75	25	0	100	3
4		Core Elective -IV**	3:0:0	3	75	25	0	100	3
5	ECE-406N***	Project-II	0:0:14	14	0	100	100	200	3
6	ECE-408N	Wireless & Mobile Communication lab	0:0:3	3	0	40	60	100	3
7	ECE-410N	Microwave Engineering Lab	0:0:3	3	0	40	60	100	3
8	ECE-412N*	Seminar & Report Writing	2:0:0	2	0	100	0	100	3
		Total		**35**	**300**	**380**	**220**	**900**	
9	ECE-440N****	General Fitness &ProfessionalAptitude						100	3

** Theperformanceofthestudentwill beevaluatedbythepresentationdeliveredandthe reportsubmittedbythe studentrelatedtoIndustrial/Researchproblems &itssuggested solutions.*

*** Thestudents shouldopt twodepartmentalelectivessubjectsfrom thelist ofcore electivesubjects.*

****Theprojectshouldbeinitiatedbythestudentincontinuationofthe7thsemesterandwillbeevaluatedintheendofthesemesteronthebasisof a presentationandReport.*

*****A vivaofthe studentswill be takenbyexternal examiner (Principal/Director/Professor/orany seniorPerson withExperiencemore than10 years)at theendofthesemesterand gradeswill begivenaccording to the grade chart.*

S. No.	Core Electives-7thSem.		S. No.	Core Electives-8thSem.	
1	ECE-415N	Advance DigitalCommunication	1	ECE-414N	DSPProcessor
2	ECE-417N	NanoElectronics	2	ECE-416N	Mobile CommunicationNetworks
3	ECE-419N	OpticalCommunications	3	ECE-418N	MEMS
4	ECE-421N	AdaptiveSignalProcessing	4	ECE-420N	Transducers&ItsApplications
5	ECE-423N	Satellite Communication	5	ECE-422N	RadarEngineering
6	ECE-425N	DigitalVLSIDesign	6	ECE-424N	High Frequency Circuit andSystems
7	ECE-427N	AnalogCMOS ICDesign	7	ECE-426N	Biomedical Signal Processing
8	ECE-429N	ConsumerElectronics	8	ECE-428N	Multimedia Communications
9	ECE-431N	Robotics	9	ECE-430N	MixedVLSIDesign
10	ECE-433N	Non-ConventionalEnergyResources	10	ECE-432N	MicrostripAntenna
11	ECE-435N	Microstrip lineAnalysis	11	ECE-434N	Strategic Electronics
12	ECE-437N	SoftwareDefined Radios	12	ECE-436N	Cognitive Radios

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ECE-401N	MICROCONTROLLER ANDEMBEDDEDSYSTEMDESIGN					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
3	**0**	**0**	**75**	**25**	**100**	**3Hr.**
Pre-requisites: Microprocessor						
CourseOutcomes						
CO1	*Acquired knowledge about the architecture of microcontrollers.*					
CO2	*Acquired knowledge about instruction set and programming concepts in C and assembly language.*					
CO3	*To understand peripheral interfacing to microcontrollers.*					
CO4	*To design the systems /models based on microcontrollers*					

Unit- I

INTRODUTION: Microprocessor and Microcontroller, Different types of Microcontrollers, 4 bit, 8 bit, 16 bit, and 32 bit Microcontrollers, Processor Architectures: Harvard & Princeton, CISC & RISC, Microcontrollers memory types, Microcontrollers features, Criteria for choosing a microcontroller, Applications of microcontrollers.

Embedded System, Embedded Processors, Hardware units, Devices and Software in a system, Embedded system on chip, Complex Systems design and processors, Design examples.

Unit- II

8051 ARCHITECTURE: 8051 Architecture, On-chip memory organization – general purpose registers, SFR registers, Internal RAM and ROM, Oscillator and Clock circuits. Pin Diagram of 8051, I/O Pins, Port, Connecting external memory, Counters and Timers, Purpose of TCON & TMOD registers, Serial data transmission/reception and transmission modes, Purpose of SCON & PCON registers, Different Types of Interrupts, Purpose of Time Delays.

Unit- III

8051 INSTRUCTION SET AND PROGRAMMING : Instruction syntax, Assembler directives, Addressing modes, Data transfer instructions, arithmetic and logical instructions, Jump and Call instructions, I/O port, Timer and Counter programming, Serial port and Interrupt programming.

PIC MICROCONTROLLER ARCHITECTURE: Introduction to PIC Microcontroller families, Different features of PIC16 Microcontrollers, PIC16 Architecture and Pipelining, Pin Configuration of PIC16, Program memory considerations, Register file structure, Addressing modes, Instruction set.

Unit-IV

APPLICATION DESIGN & HARDWARE INTERFACING WITH 8051: Interfacing Matrix Keyboards, LCD, ADC, DAC, Temperature Sensor, Stepper and DC motor, Relay and PWM.

Introduction of Advanced Microcontrollers: AVR and ARM microcontrollers.

Text Books:

1. Kenneth Ayala," The 8051 Microcontroller" 3rd ed. CENGAGE Learning.
2. M.A. Mazidi, J.G. Mazidi, R. D. McKinlay," The 8051 Microcontroller and Embedded systems using assembly and C" -2nd Ed, Pearson Education.
3. John. B. Peatman, "Design with PIC Microcontroller", Pearson Education, 2003.

References Books:

1. MykePredko, "Programming and Customizing the 8051 Microcontroller", TMH.
2. Manish K Patel,"Microcontroller based embedded system", McGraw Hill Education.
3. Raj Kamal, "Embedded systems architecture, programming and design"-2ndnd. McGraw-Hill Companies.
4. Intel's manual on "Embedded Microcontrollers".
5. MykePredko, "Programming and customizing PIC microcontroller" Mc- Graw Hill.

6. M.A. Mazidi, R. D. McKinlay,Causey," The PIC microcontroller and Embedded Systems using assembly and C for PIC18" -2nd Ed, Pearson.
7. M.A. Mazidi,Naimi" The AVR microcontroller and Embedded Systems using assembly and C" -2nd Ed, Pearson.

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ECE-403N	DIGITAL IMAGE PROCESSING					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
4	**0**	**0**	**75**	**25**	**100**	**3 Hr.**
CourseOutcomes						
CO1	***Students should be able to explain the basics of Digital Image processing***					
CO2	***Student will be able to explain sampling and quantization of digital image***					
CO3	***Student will be able to analyze the image enhancement operations on digital image***					
CO4	***Students will be able to analyze the various image analysis and computer vision algorithm***					

Unit-I

Introduction: Processing and applications, Image representation and modeling, Image Enhancement, Restoration, analysis, reconstruction from Projections, Image Data Compression. Image Perception: Light, Luminance, Brightness, Contrast, MFT of visual System, Visibility Function, Image fidelity, Color representation, color matching and reproduction, color vision Model

Unit-II

Image sampling and Quantization: Introduction, Two dimensional sampling theory, practical limitations in sampling and reconstruction, Image quantization, Optimum mean square or Lloyd-Max quantizer.

Unit-III

Image Enhancement: Introduction, Point Operation, Histogram Modeling, Spatial Operations, Transform Operations, Multispectral Image enhancement, Color Image enhancement.

Unit-IV

Image Analysis and Computer Vision: Introduction, Spatial Feature Extraction, Transform features, Edge Detection, Boundary Extraction, Shape features, Image segmentation.

Text Books:

1. Digital Image Processing, third edition by Rafael C. Gonzalez and Richard E Woods. Publisher: Pearson Education.
2. Digital Image Processing by S. Sridhar , Publisher: Oxford

Reference Books:

1. Fundamentals of Digital Image Processing by Anil K Jain, Publisher: Prentice Hall

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ECE-405N	POWER ELECTRONICS					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
3	**0**	**0**	**75**	**25**	**100**	**3 Hr.**
Purpose	***To understand and acquire knowledge about various power semiconductor devices. To prepare the students to analyze and design different power converter circuits.***					
Course Outcomes						
CO1	***Acquire knowledge about fundamental concepts and techniques used in power electronics.***					
CO2	***Ability to analyze various single phase and three phase power converter circuits and understand their applications.***					
CO3	***Foster ability to identify basic requirements for power electronics based design application.***					
CO4	***To develop skills to build, and troubleshoot power electronics circuits.***					

Unit-1

Introduction: Concept of Power Electronics, Applications of power electronics, Advantages and disadvantages of power-electronic converters, Power electronic systems, Power semiconductor devices, Types of power electronic converters. Power semiconductors: The p-n junction, Basic structure of power diodes, Characteristics of power diodes, Power transistors, Power MOSFETS, Insulated gate bipolar transistor, Static induction transistor.

Unit-II

Thyristors :Terminal characteristics of thyristors, thyristor turn on methods, Switching characteristics of thyristors, Thyristor gate characteristics, Two-transistor model of a thyristor, Thyristor ratings, Thyristor protection, Improvement of thyristor characteristics, Series and parallel operation of thyristors, Gate turn off thyristor, Firing circuits for thyristors.

Thyristor Commutation: Class A commutation: Load commutation, Class B commutation: Resonant commutation, Class C commutation: Complementary commutation, Class D commutation: Impulse commutation, Class E&F commutation.

Unit–III

Phase Controlled Rectifiers: Principle of phase control, Full wave controlled converters, Single phase full wave converters, Single phase symmetrical and asymmetrical semi converters, three phase rectifiers and thyristor converters, Performance parameters of three phase full converters, Effect of source impedance on the performance of converters. Principle of chopper operation, Control strategies, Step up choppers, Types of chopper circuits, Single phase voltage source inverters: Operating principle, Force commutated thyristor inverters, Voltage control in single phase inverters.

Unit-IV

AC Voltage Controllers: Principle of phase control, Principle of integral cycle control, single phase ac voltage controller with R load and RL load.

Cycloconverters: Principle of cycloconverter operation, step up and step down cycloconverters, Three phase half wave converters, Output voltage equation for a cycloconverter, Load commutated cycloconverter.

Text Books

1. P S Bimbhra: Power Electronics, Khanna Publishers.

Reference Books

1. M. H. Rashid. : Power Electronics – circuits, devices & applications, Pearson Education.

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ECE-407N	MICROCONTROLLERANDEMBEDDEDSYSTEMDESIGN LAB					
Lecture	**Tutorial**	**Practical**	**Sessionals**	**Practical**	**Total**	**Time(Hrs)**
0	**0**	**3**	**40**	**60**	**100**	**3**
Course Objectives	*1. To design of microcontroller based systems.* 2. *To impart practical knowledge of 8051 and PIC Microcontrollers*					
CourseOutcomes						
CO1	*To familiarization with 8051 and PIC Microcontrollers.*					
CO2	*Ability to write a C language and assembly language program for 8051 Microcontroller.*					
CO3	*Ability to interfacing the various Peripheral to 8051 Microcontrollers.*					
CO4	*Ability to design the embedded systems based on 8051 Microcontrollers.*					

List of experiments to be performed using 8051 Microcontrollers

1. (a) To study different commands of 8051 trainer kit with their function.

   (b) To study architectural block and pin diagram of 8051 microcontroller and PIC16C74 microcontroller.
2. To write an ALP to perform addition, subtraction, multiplication and division of two unsigned numbers.
3. To write an ALP to perform logical operation i.e., AND, OR, XOR and Complement of two unsigned numbers.
4. To write an ALP to perform multi byte addition and subtraction of two unsigned number.
5. To write an ALP to perform rotate operations i.e., RL, RLC, RR, RRC.
6. To write an ALP for flashing message "WELCOME M51-02 KIT" on LCD screen.
7. To write an ALP for identifying pressed number is even or odd. If number is even, message displays on LCD "NUMBER IS EVEN" and if number is odd, message displays on LCD "NUMBER IS ODD".
8. To write an ALP to perform data transfer between internal & external memory using all available addressing modes.
9. To write an embedded C program for interfacing LCD to port P0 and display message "LCD Display" on LCD screen.
10. To write an embedded C program for interfacing keypad to port P0 .Whenever a key is pressed; it should be displayed on LCD.
11. To write an embedded C program for interfacing a switch and a buzzer to two different pins of a Port such that the buzzer should sound as long as the switch is pressed.
12. To write an embedded C program for interfacing stepper motor to rotate clockwise and anticlockwise directions.
13. To write an embedded C program for interfacing relay and buzzer.
14. To write an embedded C program for interfacing PWM module to control speed of motor.
15. To write an embedded C program for interfacing LED to glow in different pattern i.e., even odd, rotate left, rotate right.
16. To write an embedded C program for interfacing temperature sensor.
17. Design an Obstacle Detector system through Ultra Sonic obstacle detection using ultrasonic transmitter receiver.

ECE-409N	DIGITAL IMAGE PROCESSING LAB					
Lecture	**Tutorial**	**Practical**	**Sessionals**	**Practical**	**Total**	**Time**
-	**-**	**3**	**40**	**60**	**100**	**3 Hr.**
CourseOutcomes						
CO1	***Students should be able to explain the basics of Digital Image processing***					
CO2	***Student will be able to explain sampling and quantization of digital image***					
CO3	***Student will be able to analyze the image enhancement operations on digital image***					
CO4	***Students will be able to analyze the various image analysis and computer vision algorithm***					

List of Experiments:

1. Study of Image processing toolbox of Matlab.
2. WAP to read and show various images of at least five different formats.
3. WAP to extract R, G, B component of Color Image.
4. WAP to convert a color image into gray scale and save it in new format.
5. WAP to invert a gray scale image.
6. WAP to implement Morphological operations on an image.
7. WAP to implement Histogram equalization.
8. WAP to implement various edge detection algorithms.
9. WAP to implement image segmentation
10. WAP to implement boundary extraction of basic structure.

ECE-402N	**WIRELESS&MOBILECOMMUNICATION**					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
4	0	**0**	**75**	**25**	**100**	**3**
Purpose	*Tointroducetheconceptsofwireless/mobilecommunicationusingcellularenvironment.Tomaketh estudentstoknowaboutthevariousmodulationtechniques,ppropagationmethods,andmultiaccess techniquesusedinthemobilecommunication.*					
Course Outcomes						
CO1	*Itdealswiththefundamentalcellularradioconceptssuchasfrequencyreuseandhandoff.*					
CO2	*Thisalsodemonstratestheprincipleoftrunkingefficiencyandhowtrunkingandinterferenceissuesb etweenmobileandbasestationscombinetoaffecttheoverallcapacity of cellularsystems.*					
CO3	*Itprovidesideaaboutanalogganddigitalmodulationtechniquesusedinwirelesscommunication.*					
CO4	*Itpresentsdifferentwaystoradiopropagationmodelsandpredictthelarge–scaleeffects ofradio propagation in manyoperatingenvironment.*					

Unit–I

IntroductiontoWirelessCommunicationSystems: Evolutionofmobileradiocommunications,exampl esof wirelesscomm.systems,pagingsystems,Cordless telephonesystems,comparisonofvariouswirelesssystems.
ModernWirelessCommunicationSystems:Secondgenerationcellularnetworks,thirdgenerationwirele ssnetworks,wirelessinlocalloop,wirelesslocalareanetworks,Bluetooth and PersonalAreanetworks.

Unit–II

IntroductiontoCellularMobileSystems:SpectrumAllocation,basicCellularSystems,performanceCrit eria,Operationofcellularsystems,analogcellularsystems,digitalCellularSystems.
CellularSystemDesignFundamentals:FrequencyReuse,channelassignmentstrategies,handoffStrateg ies,Interferenceandsystemcapacity,trackingandgrade off service, improvingcoverage and capacity.

Unit– III

MultipleAccessTechniquesforWirelessCommunication:Introductionto MultipleAccess,FDMA,TDMA,SpreadSpectrummultipleAccess,spacedivisionmultipleaccess, packetratio,capacity ofa cellularsystems.

Unit–IV

WirelessStandards-GSM,IS-95,UMTS-IMT-2000,Signaling,CallControl,MobilityManagement and locationTracing.

Suggested Books:

1. TheodoreS.Reppaport,WirelessCommunicationsPrinciples and Practice,IEEEPress,PrenticeHall.
2. WilliamC.Y.Lec,MobileCellularTelecommunications,AnalogandDigitalSystems,Mc-Graw Hill Inc.
3. KamiloFeher,WirelessDigitalCommunications,Modernization&SpreadSpectrumApplications, PrenticeHall of India,New Delhi.
4. KavehPahlavanandAllenH.Levesque"WirelessInformationNetworks",WileySeries, JohnWiley and Sons Inc.

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ECE-404N	MICROWAVE ENGINEERING					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
3	**0**	**0**	**75**	**25**	**100**	**3 Hrs**
Purpose	*AsapartofRFcommunicationtechnologythepurposeofthiscourseistocreateawarenessaboutconventionalmicrowaveresonators,generators,componentsanddevices alongwiththeimportanceofscatteringparameterssothat thelearnerisabletodesignandapplythesebasicapproachesincommercialaswellas defenseapplications*					
CourseOutcomes						
CO1	***Learnerwillbeabletomathematicallydesignbasicresonatorcavitiesandwillbeabletomeasuremicrowaveparameterssuchasimpedance,frequencyandVSWRetc.***					
CO2	***Learnerwill learnthe conventional methods to generate the microwaves.***					
CO3	***Learnerwillknowabouttheimportanceofscatteringparametersalongwithitsapplications in the analysis ofbasic microwavecomponents.***					
CO4	***Learnerwilllearnabouttransferredelectronandavalanchetransittimedevicesindetail.***					

Unit-I

MicrowaveResonators:
Briefdescriptionofwaveguides,coplanarwaveguides,cavityresonators:rectangular,cylindrical,sphericalandcoaxial,excitationandcouplingofcavities,Qfactor.MicrowaveMeasurements:MeasurementofFrequency, Impedance(usingslottedsection)attenuation,power,dielectricconstant,measurement of V.S.W.R.,insertion loss andpermeability

Unit-II

MicrowaveGenerators:
Construction,characteristics,operatingprincipleandtypicalapplicationsofKlystron(twocavity,multicavity),ReflexKlystron,magnetron(CylindricalmagnetronanddescriptionofΠ modeapplications)andTravelingWaveTube(TWT).

Unit-III

Matrix Description of MicrowaveCircuits:
ScatteringMatrix:properties,measurementofscatteringcoefficients,scatteringmatricesforcommonmicrowavesystems.MicrowaveComponents:Waveguidetees-E-plane,H-plane,magic tee, rat race,directionalcoupler,tuningscrewsandstubs,isolators and circulators-theirconstructionalfeaturesandapplications.Microwavefilters,Phaseshifters,attenuators,andfrequencymeter.

Unit-IV

Solid State MicrowaveDevices: TransferredElectronDevices-GunnEffect;negativedifferentialresistancephenomenon,fielddomainformation,Gunndiodestructure.Avalanchetransittimedevices:IMPATT,TRAPATT,BARITT diodes,Parametricamplifiers

Text Book:

1. Samuel Y. Liao, Microwave Engineering, Pearson Education 3rd/4th/ higher Ed.

Reference Books:

2. Annapurna&SisirK.Das,MicrowaveEngineering,TataMcGraw-Hill.
3. David M. Pozar,MicrowaveEngineering, John Wiley and Sons Inc.

ECE-408N	WIRELESS&MOBILECOMMUNICATIONLAB					
Lecture	**Tutorial**	**Practical**	**Sessionals**	**Practical**	**Total**	**Time**
-		3	40	60	100	3Hour
Purpose	***TogivethestudentsanideaabouttheWirelesscommunicationtheoryandtechnologyusingtheNI-LabviewsoftwareandRFcommunicationmodule.***					
Course Outcomes						
CO1	***Tostudy thewirelesscommunication using NI-Labview***					
CO2	***Tolearn aboutthefunctioning of Universal Software Radio Peripheral (USRP)***					
CO3	***Tolearntheimplementationofdifferent analogmodulationschemes using the USRP.***					
CO4	***Tolearntheimplementationofdifferent digital modulationschemes using the USRP.***					

List of Experiments:

1. Introductionto NI-LabVIEWand familiarizationwith its basicfunctions.
2. Study of modulationtoolkit andits usage in WirelessCommunication.
3. Study the interfacing of hardware(USRPmodule)with the PCand configuring the same.
4. Implementation of AM using SoftwareDefinedRadio(SDR).
5. Implementation of FM using SDR withapplication such as transfer of files
6. Implementation of M-PSK transmitter using SDR concept.
7. Implementation of M-PSK receiverusingSDR
8. Implementation of M-QAMtransmitter using SDR.
9. Demonstrates the use of theBluetoothfunctionsto set up data transfervia Bluetoothbetween a serverVI anda clientVI.
10. Designtwo-dimensionalconvolutionto performimage edge detection.
11. Implementation of M-QAMreceiver using SDR.
12. Implementation of PSKModulationsystemwithConvolutionalCoding.
13. Implementation of FSKModulationsystemwithBCHCoding.
14. Implementation of QAMModulationsystemwithGolayCoding

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ECE-410N	**MICROWAVE ENGINEERING LAB**					
Lecture	**Tutorial**	**Practical**	**Sessionals**	**Practical**	**Total**	**Time**
-		**3**	**40**	**60**	**100**	**3Hour**
Purpose	***Togivethestudentsanideaaboutthestudy and analysis of components used in Microwave Engg.***					
Course Outcomes						
CO1	***Students will learn the steps to analyze microwave components.***					
CO2	***Students will be able to find the characteristics of microwave components.***					
CO3	***Students will learn the steps to analyze various antennas.***					
CO4	***Students will be able to find the characteristics of various antennas.***					

List of Experiments:

1. To study microwave components.
2. To study the characteristics of the reflex Klystron tube and to determine its electronic tuning range.
3. To determine the frequency and wavelength in a rectangular waveguide working in TE_{10} mode.
4. To determine the standing wave ratio and reflection coefficient.
5. To study the I-V characteristics of gunn diode.
6. To study the magic Tee.
7. To study the isolator and attenuator.
8. To measure the coupling coefficient and directivity of a waveguide directional coupler.
9. To measure the polar pattern and the gain of a waveguide horn antenna.
10. To measure the insertion loss and attenuation.

ECE-415N	Advance Digital Communication					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
4	**0**	**0**	**75**	**25**	**100**	**3 Hr.**
Purpose	***To understand and acquire knowledge about various power semiconductor devices. To prepare the students to analyze and design different power converter circuits.***					
Course Outcomes						
CO1	***Acquire knowledge about fundamental concepts and techniques used in digital communications***					
CO2	***Ability to analyze various techniques of communication and understand their applications.***					
CO3	***Foster ability to identify basic requirements for power digital communication based design application.***					
CO4	***To develop skills to build, and troubleshoot on digital communication circuits***					

Unit-I

Probability and Stochastic Processes: Probability: Random Variables, Probability Distribution, and Probability Densities, Functions of Random Variables, Statistical Average of Random Variables, Some Useful Probability Distributions, Upper Bounds on the Tail Probability, Sums of Random Variables and Central Limit Theorem.Stochastic Processes: Statistical Averages, Power Density Spectrum, Response of a Linear Time - Invariant System to a Random Input Signal, Sampling Theorem for Band- Limited Stochastic Processes, Discrete-time Stochastic Signals and Systems, Cyclostationary processes.

Unit -II

Source coding: Mathematical Models for Information Sources, A Logarithmic Measure of information: Average Mutual Information and Entropy, Information Measure for Continuous Random Variables. Coding for Discrete Sources: Coding for Discrete Memory less sources, Discrete Stationary Sources, The Lempel-Ziv Algorithm.Coding for Analog Sources-Optimum Quantization: Rate- Distortion Function, Scalar Quantization, Vector Quantization. Coding Techniques for Analog Sources: Temporal Waveform Coding, Spectral Waveform Coding, Model- Based Source Coding.

Unit -III

Characterization of Communication Signal and Systems: Signal Space Representation: Vector Space Concept, Signal Space Concept, Orthogonal Expansion of Signals, Gram Schmitt Procedure.
Optimum Receivers for the Additive White Gaussian Noise Channel: Performance of the Optimum Receiver for Memory Less Modulation: Probability of Error for Binary Modulation, Probability of Error for M- ary Orthogonal Signals, Probability of Error for M- ary Binary- Coded Signals, Probability of Error for M-ary PAM, Optimum Receiver for Binary Signals.

Unit -1V

Carrier and Symbol Synchronization: Signal Parameter Estimation: The Likelihood Function, Carrier Recovery and Symbol Synchronization in Signal Demodulation.Carrier Phase Estimation: Maximum Likelihood Carrier Phase Estimation, The Phased – Locked Loop, Effect of Additive Noise on the Phase Estimate, Decision Directed Loops, Non- Decision Directed Loops.

Text Book:*Digital Communication*, J.G. Proakis, Prentice Hall India.
Reference Book: *Principles of Communication Systems,*Taub& Schilling,McGraw Hill Education; 3rd.

ECE-417N	NANO ELECTRONICS					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
4	**0**	**0**	**75**	**25**	**100**	**3Hour**
Course Outcomes						
CO1	***Studentswillbeusingphysics,mathematics,andmaterialscienceengineeringtounderstandthelatestdevelopmentintheareaof MicroelectronicsleadingtoNanoelectronics.***					
CO2	***StudentsbeabletounderstandthefundamentalsofclassicalCMOStechnologyandissuesinscalingMOSFETinthesub-100nmregime***					
CO3	***Understandingbasicprinciplesofnon-classicaltransistorswithnewdevicestructureandnanomaterials.***					
CO4	***UnderstandtheissuesinrealizingGermaniumandcompoundsemiconductorMOSFET.***					
CO5	***Studentswilllearnmaterialscharacterizationtechniquesextensively.***					

Unit-I

Overview:Nanodevices,Nanomaterials,DefinitionofTechnologynode,BasicCMOSProcessflow,MOS Scalingtheory,Issuesinscaling,Shortchanneleffects,Descriptionofatypical65nmCMOStechnology,Requirementsfor NonclassicalMOStransistor,MOScapacitor,Roleofinterfacequalityandrelatedprocesstechniques,Gateoxidethicknessscalingtrend,SiO2vsHigh-kgatedielectrics.Integrationissuesofhigh-k,Interfacestates,bulkcharge,bandoffset,stability,etc.

Unit-II

MetalGateTransistor:Motivation,requirements,IntegrationIssues,TransportinNanoMOSFET,velocitysaturation,ballistictransport,injectionvelocity,velocityovershoot,SOI-PDSOIandFDSOI.,UltrathinbodySOI-doublegatetransistors,Verticaltransistors-FinFETandSurroundgateFET,Metalsource/drainjunctions-PropertiesofschotkyjunctionsonSilicon,Germaniumandcompoundsemiconductors–Workfunctionpinning,GermaniumNanoMOSFETs:strain,quantization,AdvantagesofGermaniumover Silicon.

Unit-III

PMOSversusNMOS,Compoundsemiconductors-materialproperties,MESFETsCompoundsemicocnductorsMOSFETsinthecontextofchannelquantizationandstrain,HeterostructureMOSFETsexploitingnovelmaterials,strain,quantization.
SynthesisofNanomaterials:CVD,NucleationandGrowth,ALD,Epitaxy,MBE.Compoundsemiconductorhetero-structuregrowth,emergingnanomaterials:Nanotubes,nanorodsandothernanostructures,LBtechnique,Softlithographyetc.Microwaveassistedsynthesis,Selfassemblyetc.

Unit-IV

Characterization:QuantumwellsandThicknessmeasurementtechniques:Contact-stepheight,Optical-reflectanceandellipsometry,AFM,NanomaterialsCharacterizationtechniques:FTIR,XRD,AFM,SEM, TEM,EDAXandinterpretationofresults.

Books:

1. FundamentalsofModernVLSIDevices,Y.TaurandT.Ning,CambridgeUniversityPress.SiliconVLSITechnology,Plummer,Deal,Griffin,PearsonEducationIndia.
2. EncyclopediaofMaterialsCharacterization,Editedby:Brundle,C.Richard;Evans,CharlesA.Jr.;Wilson,Shaun;Elsevier.

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ECE - 419N	OPTICAL COMMUNICATION					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
3	**0**	**0**	**75**	**25**	**100**	**3 Hr.**
Purpose	*To familiarize the students with the concepts of Optical communication covering thecontents of optical fibers, losses in fibers, optical sources, detectors etc.*					
Course Outcomes						
CO1	*Students will be able to understand the structure of fiber and the mechanism of light travelling in the fiber.*					
CO2	*Students will be able to analyze various losses associated with fibers.*					
CO3	*Students will learn about the optical sources and optical detecters.*					
CO4	*Students will be able to understand the various components needed in optical networks*					

Unit – I

INTRODUCTION : Optical Fibers: Structure, Propagation within the fiber, Numerical aperture of fiber, step index and graded index fiber, Modes of propagation in the fiber, Single mode and multi mode fibers. Splices and connectors. Optical Power Launching and Coupling. Fiber-to-fiber joints.

Unit–II

LOSSES IN OPTICAL FIBER : Rayleigh Scattering Losses, Absorption Losses, Leaky modes, Mode coupling losses, Bending Losses, Combined Losses in the fiber.

DISPERSION EFFECT: Effect of dispersion on the pulse transmission Intermodal dispersion, Material dispersion, Wave guide dispersion, Polarization Mode Dispersion Total dispersion, Transmission rate. Dispersion Shifted Fibers, Dispersion Compensating Fibers.

Unit – III

LIGHT SOURCES : LEDS, Laser Action in semiconductor Lasers, Semiconductor Lasers for optical communication – Laser modes, Spectral Characteristics, Power Voltage Characteristics, Frequency response.

DETECTORS : P-I-N Photodiode, APD, Noise Analysis in detectors, Coherent and non-coherent detection, Infrared sensors. Bit error rate.

Unit– IV

THE FIBER-OPTIC COMMUNICATION SYSTEM: Design considerations of fiber optic systems: Analog and digital modulation. Optical Devices: Optical coupler, space switches, linear divider-combiners, wavelength
division multiplexer and demultiplexer, optical amplifier

OPTICAL NETWORKS: Elements and Architecture of Fiber-Optic Network, Optical link network-single hop ,multihop, hybrid and photonic networks.

Suggested Books:

1. John Power, An Introduction to Fiber optic systems, McGraw Hill International.
2. John Gowar , Optical communication Systems.
3. R. Ramaswamy, Optical Networks, Narosa Publication
4. John M. Senior,Optical Fiber Communication
5. Gerd Keiser, Optical Fiber Communication

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ECE - 421N	ADAPTIVE SIGNAL PROCESSING					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
3	**0**	**0**	**75**	**25**	**100**	**3 Hr.**
Purpose	*To familiarize the students with various stochastic processes and models, analysis of wiener filters, steepest descent algorithms. Also, students will be able to understand LMS & RLS algorithms and check the robustness and study the Finite-Precision effects on LMS and RLS algorithms.*					
Course Outcomes						
CO1	*To understand various stochastic processes and models in adaptive signal processing.*					
CO2	*To understand the analysis of wiener filters, the concept of the linear prediction and steepest descent algorithms.*					
CO3	*To understand the concept and use of Least-Mean-Square (LMS) & Recursive Least-Squares (RLS) algorithms with applications to specific engineering problems.*					
CO4	*To apply the concept robustness and analysis the Finite-Precision effects on LMS and RLS algorithms.*					

Unit -I

Stochastic Processes and Models: Partial Characterization of a Discrete-Time Stochastic Process, Mean Ergodic Theorem, Correlation Matrix, Correlation Matrix of Sine Wave Plus Noise, Stochastic Models, Wold Decomposition, Asymptotic Stationarity of an Autoregressive Process, Yule—Walker Equations.

Wiener Filters: Linear Optimum Filtering: Statement of the Problem, Principle of Orthogonality, Minimum Mean-Square Error, Wiener-Hopf Equations, Error-Performance Surface, Multiple Linear Regression Model.

Unit -II

Linear Prediction: Forward Linear Prediction, Backward Linear Prediction, Levinson-Durbin Algorithm, Properties of Prediction-Error Filters, Schur-Cohn Test.

Method of Steepest Descent: Basic Idea of the Steepest-Descent Algorithm, The Steepest-Descent Algorithm Applied to the Wiener Filter, Stability of the Steepest-Descent Algorithm, Example, The Steepest-Descent Algorithm as a Deterministic Search Method, Virtue and Limitation of the Steepest-Descent Algorithm.

Unit -III

The Least-Mean-Square (LMS) Algorithm: Signal-Flow Graph, Optimality Considerations, Applications, Statistical Learning Theory, Transient Behavior and Convergence Considerations, Efficiency.

The Recursive Least-Squares (RLS) Algorithm: Some Preliminaries, The Matrix Inversion Lemma, The Exponentially Weighted RLS Algorithm, Selection of the Regularization Parameter, Update Recursion for the Sum of Weighted Error Squares, Example: Single-Weight Adaptive Noise Canceller.

Unit -IV

Robustness: Robustness, Adaptation, and Disturbances, Robustness: Preliminary Considerations Rooted in H∞ Optimization, Robustness of the LMS Algorithm, Robustness of the RLS Algorithm, Comparative Evaluations of the LMS and RLS Algorithms from the Perspective of Robustness.

Finite-Precision Effects: Quantization Errors, Least-Mean-Square (LMS) Algorithm, Recursive Least-Squares (RLS) Algorithm, Summary and Discussion.

TEXT BOOKS:

1. S. Haykin, Adaptive filter theory, Pearson

REFERENCE BOOKS:

ECE-423N	SATELLITE COMMUNICATION					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
3	**0**	**0**	**75**	**25**	**100**	**3 Hr.**
Purpose	*To familiarize the students with the concepts of Satellite communication and various terms, laws and multiple access schemes used in its working***.**					
Course Outcomes						
CO1	***To understand the concept of basics of satellite communication and various basic laws and terms of satellite communication.***					
CO2	***To understand the concept and processes of various communication satellites used in satellite communication.***					
CO3	***To familiarize with the concept and design issues of satellite link design and satellite access.***					
CO4	***To familiarize with the concepts of Multiple access schemes used in satellite communication.***					

1. T. Adali and S. Haykin, Adaptive Signal Processing, Wiley India
2. B. Widrow and S.D. Stearns, Adaptive signal processing, Prentice Hall.

Unit-I

SATELLITE ORBITS: Orbital Mechanics- Kepler's laws ,locating the satellite in the Orbit, locating the satellite with respect to the earth, Orbital elements, look angle determination, Sub satellite point, Azimuth and elevation angle calculation, Orbital perturbations, Longitudinal and Inclination changes; Launches and launch vehicles-ELV's, Placing the satellite into geostationary orbit, Doppler shift, range variations, solar eclipse, sun transit outage.

Unit-II

COMMUNICATION SATELLITES: Satellite Subsystems, Attitude and Orbit Control system(AOCS), Telemetry, Tracking, Command and Monitoring (TTC&M), Power System, Communication Subsystems-description, Transponders, satellite antennas-basic antenna types, basic antennas in practice.

Unit-III

Satellite link design and Satellite access: Basic transmission theory**,** system noise temperature and G/T ratio; Downlink design-link budget; Uplink design; design for specified C/N, uplink and downlink attenuation in rain, communication link design procedure; system design examples.

Unit–IV

Multiple access schemes: FDMA, TDMA, CDMA, DAMA; VSAT systems-basic techniques, VSAT earth station engineering, system design; DBS systems-C-band and Ku band home TV, digital DBS; satellite mobile systems; GPS

Text Books:

1. Timothy Pratt, Satellite Communications, Wiley India edition

Reference Books:

1. Anil K Maini, Satellite Communication, Wiley India edition

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ECE-425N	**Digital VLSI Design**					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
3	**-**	**-**	**75**	**25**	**100**	**3 Hr.**
Purpose	*Analog CMOS circuits are used in amplifiers and various filters circuits. This course teaches design methods of CMOS IC circuits.*					
Course Outcomes						
CO1	*To understand MOS digital circuits concepts*					
CO2	*To understand the MOS inverter and its design*					
CO3	*To learn MOS combinational and sequential circuit design*					

Unit-I

Introduction: Introduction to MOSFETs : MOS Transistor Theory – Introduction MOS Device, Fabrication and Modeling , Body Effect, Noise Margin; Latch-up

Unit-II

MOS Inverter: MOS Inverter, MOS Transistors, MOS Transistor Switches, CMOS Logic, Circuit and System Representations, Design Equations, Static Load MOS Inverters, Transistor Sizing, Static and Switching Characteristics; MOS Capacitor.

Unit-III

MOS Combinational circuits: Combinational MOS Logic Circuits: Pass Transistors/Transmission Gates; Designing with transmission gates, Primitive Logic Gates; Complex Logic Circuits.

Unit-IV

MOS Sequential Circuits: Sequential MOS Logic Circuits: SR Latch, clocked Latch and flip flop circuits, CMOS D latch and edge triggered flip flop.

Books:

1. S. M. Kang and Y. Leblebici, CMOS Digital Integrated Circuits : Analysis and Design, Third Edition,
MH, 2002.
2. N. Weste, K. Eshraghian and M. J. S. Smith, Principles of CMOS VLSI Design : A Systems Perspective, Second Edition (Expanded), AW/Pearson, 2001.
3.J. P. Uyemura, CMOS Logic Circuit Design, Kluwer, 1999.

ECE-427N	**Analog CMOS IC Design**					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
3	**-**	**-**	**75**	**25**	**100**	**3 Hr.**
Purpose	*Analog CMOS circuits are used in amplifiers and various filters circuits. This course teaches design methods of CMOS IC circuits.*					
Course Objectives						
CO1	*To understand CMOS digital circuits concepts*					
CO2	*To design Analog circuits using CMOS.*					
CO3	*To learn modeling of CMOS based amplifiers circuits*					

Unit-I

Basic Analog CMOS Circuits: Introduction to analog design, Passive and active current mirrors, Switched Capacitor circuits - basic principles, sampling switches, switched capacitor integrator, switched capacitor amplifier.

Unit-II

CMOS single stage Amplifiers: Common-Source stage with resistive load and diode connected load, source follower, common-gate stage, cascode stage, folded cascode stage. Frequency responses of CS stage, CD stage, CG stage, cascode stage.

Unit-III

Differential Amplifier & Op-Amp: Single-ended and differential operation, basic differential pair – qualitative and quantitative analyses, common-mode response, differential pair with MOS loads, Performance parameters of op-amp, one stage op-amp, two-stage CMOS op-amp, slew rate, power supply rejection.

Unit-IV

Oscillators: General considerations, Ring oscillators, LC oscillators – cross-coupled oscillators, Colpitts oscillator, One-port oscillator, and voltage controlled oscillators.

Books:

1.Razavi, "Design of analog CMOS integrated circuits", McGraw Hill, Edition 2002.

2. Allen, Holberg, "CMOS analog circuit design",Oxford UniversityPress, 2nd Edition, 2012.

ECE-429N	**CONSUMERELECTRONICS**					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
3	**0**	**0**	**75**	**25**	**100**	**3Hr.**
Purpose	*Tofamiliarizethestudentswiththeconceptsofaudioandvideosystemsandalso Withvariousadvancedelectronicgadgetsandhomeappliances*					
CourseOutcomes						
CO1	***Tounderstandtheconceptofbasicaudiosystemand AM/FM tuners.***					
CO2	***Tounderstandtheconcept of Video Systems.***					
CO3	***Tounderstandthevariousadvancedelectronicgadgets.***					
CO4	***Tounderstandthevariouselectronichomeappliances.***					

Unit-I

AudioSystem: Wavemotion,Microphones,HeadphonesandHeadsets,Loudspeakers,Acoustics,DiscrecordingandDistortionindiscandtape,Opticalrecordingandreproduction,Controlcircuits,Amplifyingsystems,Portablestereo,TheatresoundsystemandAM/FMtuners.

Unit-II

VideoSystems:MonochromeTVstandardsandsystems,ColourTVstandardsandsystems,Monochromeandcolour TVcontrols,VideoTaperecordingandreproduction,videodiscrecordingandplayback,Remotecontrolsand Videosystems.

Unit-III

ElectronicGadgets:TelecommunicationSystems,SwitchingSystems,Modulationtechniques,Fiberoptics,MobileSystems,XerographyandFascimilefax,AutomatedTellerMachinesandTopBoxes.

Unit-IV

HomeAppliances:Digitalclocks,In-CarComputers,Microwaveovens,WashingMachines,AirConditionersandRefrigerators.

ReferenceBooks:

1. ConsumerElectronicsByS.P.Bali,PearsonEducation,1st edition.
2. Colour Television-principles&practiceR.RGulatibyWileyEasternLimited,NewDelhi.
3. ColourTelevision&VideoTechnologybyA.K.MainiCSBPublisher
4. VCR-principles,maintenance&repairbyS.P.Sharma,TataMcGrawHill,New Delhi
5. Colour TVbyA.Dhak.

ECE-431N	**ROBOTICS**					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
3	**0**	**0**	**75**	**25**	**100**	**3 Hr.**
Course Outcomes						
CO1	***The basic concepts related to robot, Parts of robots, End effectors and to make the student familiar with the various drive systems for robot.***					
CO2	***Various sensors and machine vision and their applications in robots.***					
CO3	***About various control system, robot programming, Artificial intelligence and safety standards of robots***					
CO4	***Industrial and Non-industrial Applications of robots.***					

Unit–I

Fundamentals of Robot: Definition, History and Development in robot technology. Robot Technology: Characteristics, Basic Components, Robot Anatomy, Robot Generations, Robot selection, Present and Future Applications.

Robot Drive Systems and End Effectors: Robot Classification: Arm geometry, Degrees of freedom, Power sources, Types of motion, Path Control. Robot End Effectors: Mechanical grippers, Vacuum, Magnetic, Adhesive. Special purpose grippers, Process tooling, Compliance, Robot Drive systems: Hydraulic, Pneumatic and Electric system.

Unit-II

Sensor : Requirements of a sensor, Sensor classification, Principles and Applications of the following types of sensors : Position of sensors (Potentiometer, Encoder, LVDT, Resolvers, LMDT, Hall – effect sensors),Velocity sensors(Encoder, Tachometer, Differentiation of position signal),Acceleration sensors, Force and Pressure Sensors(Piezoelectric, Force sensing resistor, Strain Gauge, Antistatic foam), Torque Sensors, Micro switches, Visible light and Infrared Sensors, Touch and Tactile sensors, Proximity Sensors(Magnetic, optical, Ultrasonic, Inductive, Capacitive, Eddy Current), Range Finder (Ultrasonic, Light-based, GPS), Sniff Sensors, Taste Sensors, Vision Sensors, Voice recognition devices, Voice synthesizers, RCC.

Machine Vision : Visual sensing, Architecture of robotics vision system, Machine vision: Image acquisition (Vidicon tube, CCD), Digitization, Image processing, Image Analysis, Image interpretation. Machine vision application, other optical methods.

Unit-III

Control System, Programming and Artificial Intelligence: Control Systems: PLC, PID, CNC, MPU, URC. Robot programming: Programming methods, Languages, levels of robot programming, Program statements. Elements of Artificial Intelligence, System architecture, Application of fuzzy logic in robotics, Robot Safety, safety standards.

Unit–IV

Robot Applications: Industrial applications, Automation in manufacturing, Robot applications, Material handling, Processing application, Assembly application, Inspection application, evaluating the potential of a robot application, future applications, challenge for the future, Innovations, Non-industrial application.

Text Books:

1. James G. Keramas, " Robot technology fundamentals", Delmar Publishers.
2. Saeed B. Niku, "Introduction to robotics analysis,control and applications", 2nd ed., Wiley India.
3. R. K. Mittal,I.J.Nagrath, "Robotics and Control", TMH Education Pvt. Lmt.

ECE-433N	NON-CONVENTIONAL ENERGY RESOURCES					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
3	**-**	**-**	**75**	**25**	**100**	**3Hour**
Course Outcomes						
CO1	***Tounderstandtheenergydemandofworld,nationandavailableresourcestofulfill the demand***					
CO2	***Toknowabouttheconventionalenergyresourcesandtheireffectiveutilization***					
CO3	***Toacquiretheknowledgeofmodernenergyconversiontechnologies***					
CO4	***Tobeabletounderstandandperformthevariouscharacterizationtechniquesoffuels***					
CO5	***Tobeabletoidentifyavailablenonconventional(renewable)energyresourcesandtechniquestoutilizethemeffectively.***					

Unit-I

Introduction: Energydemandofworldandcountryandgapanalysis,Fossilfuelbasedsystems,Impactoffossilfuel basedsystems,Nonconventionalenergy–seasonalvariationsandavailability,Renewableenergy–sourcesandfeatures,Hybridenergysystems.Distributedenergysystemsanddispersedgeneration(DG).

Unit-II

Solarthermalsystems: Solarradiationspectrum,Radiationmeasurement,Technologies,Applications,Heating,Cooling,Drying,Distillation,Powergeneration;Costing:Lifecyclecosting(LCC),Solarthermalsystem SolarPhotovoltaicsystems,Operatingprinciple,Photovoltaiccellconcepts,Cell,module,array,Seriesandparallelconnections,Maximumpowerpointtracking,Applications,Batterycharging,Pumping,Lighting,Peltiercooling,Costing:Lifecyclecosting,SolarPVsystem

Unit-III

Microhydel:
Operatingprinciple,Componentsofamicrohydelpowerplant,Typesandcharacteristicsofturbines,Selectionand modification,Loadbalancing,Costing:Lifecyclecosting-Microhydel
Wind;Windpatternsandwinddata,Siteselection,Typesofwindmills,Characteristicsofwindgenerators,Loadmatching,Lifecyclecosting-WindsystemLCC

Unit-IV

Biomass:Learningobjectives,Operatingprinciple,Combustionandfermentation,Anaerobic digester,Woodgassifier,Pyrolysis,Applications,Biogas,Woodstoves,Biodiesel,Combustionengine,Lifecyclecosting-BiomasssystemLCC
HybridSystems,NeedforHybridSystems,RangeandtypeofHybridsystems,CasestudiesofDiesel-PV,Wind-PV,Microhydel-PV,Biomass-Dieselsystems,electricandhybridelectricvehicles

SuggestedBooks:

1. Ashok V Desai,Non-Conventional Energy, WileyEasternLtd,New Delhi, 2003
2. Mittal KM, Non-Conventional Energy Systems, Wheeler Publishing Co.Ltd,New Delhi,20033.Ramesh R & Kumar KU, Renewable Energy Technologies,Narosa PublishingHouse,New Delhi,2004
4.Wakil MM,PowerPlant Technology,McGraw Hill Book Co,New Delhi, 2004.

ECE-435N	MICROSTRIP LINE ANALYSIS

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Lecture	Tutorial	Practical	Theory	Sessionals	Total	Time
3	-	-	75	25	100	3Hour
Purpose	*To create awareness about the basics of designing the modern tuned circuit based on microstrip circuit theory.*					
Course Objectives						
CO1	***Tounderstandtheneed of microstripline analysis.***					
CO2	***To be able to acquire knowledgeaboutthedispersion models and measurements.***					
CO 3	***To familiarize with quasi static analysis of microstrip line.***					
CO 4	***To acquire the knowledge of importance and applications of slotline type of microstrip..***					

Unit -I

Microstrip Lines I: Quasi- Static Analyses, Dispersion Models, and Measurements

Introduction, Quasi-Static Analyses of a Microstrip, Microstrip Dispersion Models, Microstrip Transitions, Microstrp Measurements.

Unit -II

Microstrip Lines II: Fullwave Analyses, Design Considerations, and Applications

Methods of Full Wave Analysis, Analysis of Open Microstrip, Analysis of Enclosed Microstrip, Design Considerations, Other Types of Microstrip Lines, Microstrip Applications.

Unit -III

Microstrip Discontinuities I: Quasi- Static Analysis and Characterization

Introduction, Discontinuity Capacitance Evaluation, Discontinuity Inductance Evaluation, Characterization of Various Discontinuities, Compensated Microstrip Discontinuities.

Unit -IV

Slotlines

Introduction, Slotline Analysis, Design Considerations, Slotline Discontinuities, Other Slotline Configurations, Slotline Transitions, Slotline Applications.

Text Book: K.C. Gupta, Ramesh Garg, InderBhal and ParkashBhartia, ***Microstrip lines &Slotlines,*** Second ed., Artech House, London

ECE-437N	**SOFTWAREDEFINED RADIOS**					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
3		**-**	**75**	**25**	**100**	**3**
Purpose	***Tounderstand Modern RadioCommunication Systemthat can bereconfigured.***					
CourseOutcomes						
CO 1	***Conceptualize the SDR and implementationdetails***					
CO 2	***DesignSDRfor a specificapplication***					
CO 3	***Identify the challengesin the maintenance of SDR***					
CO 4	***Analyse the transmitterandreceiver architectures***					

Unit-I

Introduction–SoftwareDefinedRadio–ATraditionalHardwareRadioArchitecture–SignalProcessingHardwareHistory–SoftwareDefinedRadioProjectComplexity.
ABasicSoftwareDefinedRadioArchitecture– Introduction– 2GRadio ArchitecturesHybridRadioArchitecture-BasicSoftwareDefinedRadioBlockDiagram-SystemLevelFunctioningPartitioning-DigitalFrequencyConversionPartitioning.

Unit-II

Analog-to-DigitalandDigital-to-AnalogConversion-Introduction–DigitalConversionFundamentals-SampleRate-BandpassSampling-Oversampling-AntialiasFiltering–Quantization–ADCTechniques-SuccessiveApproximation-FigureofMerit-DACs-DACNoiseBudget-ADC Noise Budget.

Unit-III

DigitalFrequencyUp-andDownConverters-Introduction-FrequencyConverterFundamentals-DigitalNCO-DigitalMixers-DigitalFilters-HalfbandFilters-CICFiltersDecimation,Interpolation,andMultirateProcessing-DUCs-CascadingDigitalConvertersandDigitalFrequencyConverters.
SignalProcessingHardwareComponents-Introduction-SDRRequirementsforProcessingPower-DSPs-DSPDevices-DSPCompilers-ReconfigurableProcessorsAdaptiveComputingMachine-FPGAs

Unit-IV

SoftwareArchitectureandComponents–Introduction-MajorSoftwareArchitectureChoices–Hardware–SpecificSoftwareArchitecture-SoftwareStandardsforSoftwareRadio-SoftwareDesignPatterns-ComponentChoices-RealTimeOperatingSystems-HighLevelSoftwareLanguages- HardwareLanguages.

TextBooks

1. PaulBurns,SoftwareDefinedRadiofor3G,ArtechHouse,2002.
2. Tony J Rouphael,RF and DSP for SDR,ElsevierNewnes Press, 2008
3. JoukoVanakka,DigitalSynthesizers and TransmitterforSoftwareRadio,Springer,2005.
4. PKenington,RF and BasebandTechniquesforSoftwareDefinedRadio,ArtechHouse, 2005.

ECE-414N	**DSP PROCESSOR**					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
3	**-**	**-**	**75**	**25**	**100**	**3Hour**

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Course Objectives	***1. To study Programmable DSP Processors.*** ***2. To provide an understanding of the fundamentals of DSP techniques.*** ***3. To study implementation & applications of DSP techniques.*** ***4. To understand architecture of DSP processor*** ***5. To understand DSP system design using FPGA.***
Course Outcomes	
CO1	*To describe the detailed architecture, addressing mode, instruction sets of TMS320C5X.*
CO2	*To write program of DSP processor.*
CO3	*To describe the detailed architecture, addressing mode, instruction sets of TMS320C54X.*
CO4	*To know DSP system design using FPGA.*

Unit-I

INTRODUCTION: Digital Signal Processing, Advantages of DSP, Applications of DSP.
Fundamentals Of Programmable Dsps: Multiplier and Multiplier accumulator, Modified Bus Structures and Memory access in P-DSPs, Multiple access memory , Multi-ported memory , VLIW architecture, Pipelining , Special Addressing modes in P- DSPs , On chip Peripherals.

Unit-II

ARCHITECTURE OF TMS320C5X: Architecture, Bus Structure & memory, CPU, addressing modes. Programming TMS320C5X: Assembly language syntax, Assembly language Instructions, Simple ALP – Pipeline structure, Operation Block Diagram of DSP starter kit, Application Programs for processing real time signals.

Unit -III

PROGRAMMABLE DIGITAL SIGNAL PROCESSORS: Block diagrams of 54X internal Hardware, buses , internal memory organization, Data Addressing modes of S320C54XX Processors, Program Control, On-chip peripheral, Interrupts ofTMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

Unit-IV

ADVANCED PROCESSORS and FPGA: Code composer studio - Architecture of TMS320C6X, Introduction to FPGA, Design flow for an FPGA based system design, FPGA based DSP system design. Comparison of the performance of the system designed using FPGA and Digital signal processors, Application note on DSP systems.

Text- Books:

1. B. Venkataramani and M. Bhaskar, Digital Signal Processors -Architecture, Programming and Applications 2nd edition, Mc Graw Hills 2011.
2. Avtar Singh, S. Srinivasan DSP Implementation using DSP microprocessor with Examples from TMS32C54XX –Thamson.

Reference Books:

1. DSP Processor Fundamentals, Architectures & Features – Lapsleyet al. , S. Chand & Co, 2000.
2. Digital signal processing-Jonathen Stein John Wiley 2005.
3. S.K. Mitra, Digital Signal Processing, Tata McGraw-Hill Publication, 2001.
4. B. Venkataramani, M. Bhaskar, Digital Signal Processors, McGraw Hil

ECE-416N	MOBILE COMMUNICATIONNETWORK					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
3		**-**	**75**	**25**	**100**	**3**
Purpose	*Toexposethestudentstothemostrecenttechnologicaldevelopmentsin Mobilecommunication systems.*					
CourseOutcomes						
CO 1	***Fundamentalconcepts inwireless,cellulartechnology***					
CO 2	***Standardsevolved***					
CO 3	***Models of mobile radio channels***					
CO 4	***Communicationtechnologiesadapted,Wireless networks***					

Unit-I

IntroductionToMobileRadioSystemsEvolutionofMobileradiocommunications– MobileradiosystemsintheU.S.andaroundtheworld– ExamplesofMobileradiosystems.**StandardsandCellularConceptCellularconcept**–Frequencyreuse– ChannelAssignmentstrategies–Handoffstrategies –InterferenceandSystem capacity–TrunkingandGrade of service – Improvingcapacityin cellularsystems.

Unit-II

MobileRadioPropagationSmall-scalemultipathpropagation–Impulseresponseofamultipathchannel– Parametersofmobilemultipathchannel–Typesofsmall-scalefading–RayleighandRiciandistributions – Statisticalmodelsformultipathfadingchannels.

Unit-III

MobileSystemandNetworkArchitecturesGSMServicesandFeatures–GSMsystemarchitecture– GSMradiosubsystem–FramestructureforGSM–SignalprocessinginGSM–GPRSnetworkarchitecture– GPRSservicesandfeatures–3GUMTSnetworkarchitecture –UMTS services and features.

Unit-IV

WirelessStandardsMultipleaccesstechniques–FDMA,TDMAandCDMA–Wirelessnetworking – Designissues in personalwirelesssystems –Cordlesssystems andWirelessLocalLoop(WLL) – IEEE802.16 FixedBroadbandWirelessAccessstandard –MobileIP andWireless ApplicationProtocol.

Text Books

1. Rappaport,T.S.,"WirelessCommunications",PrinciplesandPractice,PrenticeHall,NJ,1996.
2. WilliamStallings,"WirelessCommunicationand Networking",PearsonEducation, 2002.
3. SiegmundM.Redl,MathiasK.Weber,MalcolmW.Oliphant,"AnIntroductiontoGSM",ArtechHousePublishers,1995.
4. Kraus,J.D.,"Antennas",IIEdition,JohnWileyandSons,NY,1977.5.Collin,R.E.andZucker,F., - "Antennatheory:PartI",TataMcGraw Hill,NY, 1969.

ECE-418N	MEMS

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Lecture	Tutorial	Practical	Theory	Sessionals	Total	Time
3	**-**	**-**	**75**	**25**	**100**	**3**
CourseOutcomes						
CO 1	***Studentswillbeusingknowledgeofmathematics,science,andengineeringtounderstandvariousMEMSdevices.***					
CO 2	***Studentsbeabletounderstandvariousprocessesusedsuchasoxidation,metallization,fabricationandpackagingofMEMSdevices.***					
CO 3	***Understandingbasicprinciplesofbulkmicromachiningandcleanroomspractices***					
CO 4	***UnderstandmaterialsandMEMSpackagingtechniques.***					
CO 5	***Studentscanwriteanengineeringreportontheoneofpotential MEMSdevicesandgiveaneffectiveoralpresentation.***					

Unit-I

IntroductiontoMicrosystems:
OverviewofmicroelectronicsmanufactureandMicrosystemstechnology.Definition-MEMSmaterials.Lawsofscaling.ThemultidisciplinarynatureofMEMS.Surveyofmaterialscentralto microengineering.ApplicationsofMEMSinvariousindustries.

Unit-II

MicroSensorsandActuators: WorkingprincipleofMicrosystems-microactuationtechniques,microsensors–types,Microactuatorsandtypes,micropump,micromotors,micro–valves,microgrippers–micro-accelerometers.

Unit-III

FabricationProcessSubstrates-
singlecrystalsiliconwaferformation,Cleanroompractices,Photolithography,Ionimplantation,Diffusion,Oxidation,CVD-Physicalvapordeposition,epitaxy-etchingprocess.

Unit-IV

MicroSystemManufacturingBulkMicromanufacturing-surfacemicromachining–LIGAMicrosystempackagingmaterials-dielevel-devicelevel-systemlevel-packagingtechniques–diepreparation–surfacebondingwirebonding-sealing.Introductiontoassembly,IntroductiontoMicro-system design.

TextBooks

1. MEMSandMicrosystemsDesignandManufacture"byTai-RanHsu.TataMcGraw-Hill PublishingCompanyLtd.
2. FoundationofMEMS"byChangLiu.PearsonEducation.
3. MEMSHandbook",MohamedGad–el–Hak,CRCPress,2002.
4. Rai-ChoudhuryP.MEMSandMOEMSTechnologyandApplications",PHILearningPrivateLimited,2009.
5. SabrieSolomon,"SensorsHandbook,"McGrawHill,1998.

References

1. FrancisE.H.TayandChoong.W.O,"MicrofluidicsandBiomemsapplication",IEEEPressNew York,1997.
2. TrimmerWilliamS.,Ed.,"MicromechanicsandMEMS",IEEEPressNewYork,1997.

3. Maluf,Nadim,"AnintroductiontoMicroelectromechanicalSystemsEngineering",ARTechhouse,Boston2000.
4. JulianW.Gardner,VijayK.Varadan,OsamaO.AwadelKarim,"MicrosensorsMEMSandSmartDevices",JohnWiby&sonsLtd.,2001.

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ECE-420N	**TRANSDUCERS & ITS APPLICATIONS**					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
3		**-**	**75**	**25**	**100**	**3**
Purpose	*Understandingthestructuralandfunctionalprinciplesofsensorsandtransducersusedforvariousphysical andnonelectricquantitiesandhowtousethemtomeasurethesequantities.*					
CourseOutcomes						
CO 1	***Explaintheprinciplesofoperationofthesensorparametersandgenerators***					
CO 2	***Interpretationofthemeasurementresultsbyusingtransducers.***					
CO 3	***Developmentofmeasurementschemesfordifferentnonelectricalquantities***					
CO 4	***Assimilatingknowledgeabouttheimplementationofsensorsandtransducers.***					

Unit-I

Definitionoftransducer.Advantagesofanelectricalsignalasout-put.Basicrequirementsoftransducers,Primary and SecondaryTransducer, Analog or digital types of transducers. Resistive,inductive,capacitive,piezoelectric,photoelectricand Hall Effect tranducers.

Unit-II

Measurement of Pressure – Manometers,Forcesumming devices andelectrical transducers**Measurement of Temperature** – Metallicresistancethermometers,semi conductorresistancesensors (Thermistors),thermo-electric sensors, pyrometers.

Unit-III

MeasurementofDisplacement–
Potentiometricresistancetypetransducers,inductivetypetransducers,differentialtransformer(L.V.D.T),capacitivetransducers,Halleffectdevices,straingage transducers.
MeasurementofVelocity–
variablereluctancepickup,electromagnetictachometers,photoelectrictachometer,toothedrotortachometergenerator..

Unit-IV

MeasurementofForce–Strain-gageloadcells,pneumaticloadcell,LVDTtypeforcetransducer.
MeasurementofTorque–Torquemeter,torsionmeter,absorptiondynamometers,inductivetorque transducer,digitalmethods.

Suggested Books:

1. B.C.Nakra,K.K.Chaudhry, "InstrumentationMeasurementand Analysis,"TataMcGraw-HillPublishingCompanyLimited,NewDelhi.
2. ThomasG.Beckwithetc.all,"MechanicalMeasurements(InternationalStudentEdition),Addison-WesleyLongman, Inc. England.
3. A.K.Sawhney," A CourseinElectricaland ElectronicMeasurementsandInstrumentation,"DhanpatRai&Sons,Delhi-6.

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ECE422N	RADARENGINEERING						
Lecture	**Tutorial**	**Practical**	**Credit**	**Theory**	**Sessionals**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3Hr.**
Purpose	*Tofamiliarizethestudentswiththeconceptsof radar,varioustypesofradar,radarmixersandvariousothertechnologies.*						
CourseOutcomes							
CO1	***Tounderstandthe conceptof basicsofradar, its equationandsignals associatedwithradar.***						
CO2	***TounderstandtheconceptofCWandMTIradar.***						
CO3	***Tofamiliarizewiththeconceptoftrackingradar.***						
CO4	***Tofamiliarizewiththeconceptofradarreceiver,mixersandduplexers.***						

Unit- I

Radar BASICS:
Radar Block Diagram&operation, Applications of Radar.

Radar Equation:
SimpleformofRadarEquation,Detectionofsignalsinnoise,SignaltoNoiseratio,TransmitterPower.Pulserepetition frequenc)' &range ambiguities,Systemlosses,Propagation effects.

Unit- II

CW& Frequency Modulated Radar:
The Dopplereffect,CWRadar,FM-CWRadar,MultipleFrequency CWRadar.

MTI& Pulse Doppler Radar:
Introduction,DelayLineCancellors.MultipleorstaggeredPulserepetitionfrequencies.range-GatedDopplerFilters,Limitationof MTI performance, Noncoherent MTI,Pulse Doppler radar, MTI fromamoving platform.

Unit-III

TrackingRadar: TrackingwithRadar,SequentialLobbing,ConicalScan,MonopulseTrackingRadar,Tracking inrange,Acquisition,Low angletracking.

Unit-IV

Receivers, Displays &Duplexers:
RadarReceivers, NoiseFigure,MixerLow-noise Front ends. Displays,Duplexer,Receiver protectors.

Text Book:
I. IntroductiontoRadarSystems: Merrill!.Skolnik,; MGH
ReferenceBook:
Electronic CommunicationSystems: Kennedy; TMH.

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ECE-424N	HIGH FREQUENCY CIRCUITS AND SYSTEMS					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
3	**0**	**0**	**75**	**25**	**100**	**3Hr.**
Purpose	*This course aims to introduce the design of high frequency CMOS circuits suitable for transmitter and receiver of modern communication devices*					
CourseOutcomes						
CO1	***To explore the various performance measures of high frequency circuits.***					
CO2	***To learn the design of high frequency filters, amplifiers and oscillators.***					

Unit-I

PARAMETERS OF HIGH FREQUENCY CIRCUITS

Gain Parameters, Non-linearity parameters, Noise figure, Phase Noise, Dynamic range, RF front end performance parameters, performance trade offs in an RF circuit.

Unit-II

HIGH FREQUENCY FILTER DESIGN

Modern filter design, Frequency and impedance scaling, High Pass filter design, Band pass filter design, Band reject filter design, the effects of finite Q.

Unit- III

HIGH FREQUENCY AMPLIFIER DESIGN

Zero as bandwidth enhances,Shunt-series amplifier, Bandwidth enhancement with frequency Doublers, Tuned amplifiers, Neutralization and unilateralization , cascaded Amplifiers.

Unit-IV

MIXERS AND OSCILLATORS

Mixer fundamentals, Non linear systems as Linear mixers, multiplier based mixers, Subsampling mixers. Problems with purely linear oscillators, Tuned oscillator, Negative Resistance oscillators, frequency synthesis.

BOOKS

1. AleksandarTasic, Wouter.A.Serdijn, John.R.Long, "Adaptive Low Power Circuits for Wireless Communication (Analog Circuits and Signal Processing)", Springer, 1st Edition, 2006.

2. Chris Bowick, "RF Circuit design", Newnes (An imprint of Elesvier Science), 1st Edition, 1997. Thomas.H. Lee, "The design of CMOS Radio-Frequency Integrated Circuits",CambridgeUniversity Press, 2nd Edition, 2004.

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ECE-426N	BIO-MEDICAL SIGNAL PROCESSING					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
3		**-**	**75**	**25**	**100**	**3**
Purpose	*Tounderstand theconcept of Bio-Medical Signal Processing.*					
CourseOutcomes						
CO 1	*Introduction to signal and information.*					
CO 2	*Introduction to Biomedical Signals and ECG.*					
	Introduction to Adaptive filtering and EEG.					
CO 4	*Introduction to Event detection and waveform analysis.*					

Unit – I

Signals and Information: Definitions and properties of Laplace transform, Basic of DFT and FFT, z-transform, Sampling theorem.
Linear Time-Invariant (LTI) Systems: definitions and properties; causality, stability, impulse response, convolution, poles and zeros, frequency response, group delay, phase delay, Applications of Digital Signal Processing.

Unit – II

Introduction to Biomedical Signal: General measurement and diagnostic system, classification of signals, introduction to biomedical signals, Biomedical signal acquisition and processing.
ECG: ECG signal origin, ECG parameters-QRS detection different techniques, ST segment analysis, Arrhythmia, Arrhythmia analysis, Arrhythmia monitoring system.

Unit – III

Adaptive Filtering: Introduction, General structure of adaptive filters, LMS adaptive filter, adaptive noise cancellation, cancellation of ECG from EMG signal, Cancellation of maternal ECG in fetal ECG.
EEG: EEG signal characteristics, Sleep EEG classification and epilepsy.

Unit – IV

Event Detection and waveform analysis: Need for event detection, Detection of events & waves, Correlation analysis of EEG signals, Identification of heart sounds, Morphological analysis of ECG waves.
Frequency Domain Analysis: Introduction, Spectral analysis, linear filtering, Removal of high frequency noise (power line interference), motion artifacts (low frequency) and power line interference in ECG.

Text Book:

1. Biomedical Signal Analysis" A case study approach, Rangaraj M Rangayyan, John Wiley publications.

Reference Books:

1. "Biomedical Signal Processing Time and Frequency Domains Analysis (Volume I)", Arnon Cohen, CRC press.
2. "Biomedical Signal Processing Principles and Techniques" D.C.Reddy, Tata Mc Graw-Hill
3. "Biomedical Digital Signal Processing", Willis J. Tompkins, PHI

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ECE-428N	MULTIMEDIACOMMUNICATIONS					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
3	**0**	**0**	**75**	**25**	**100**	**3Hr.**
Purpose	*Tofamiliarizethestudentswiththeconceptsofbasicmultimediacommunicationsystemsandvariouscompressionalgorithmsoftext,audio,imageandvideo.*					
CourseOutcomes						
CO1	***Tounderstandtheconceptofbasicmultimediacomm.Systemandvarioustypesofnetworksandapplications.***					
CO2	***Tounderstandtheconcepttextandimagecompression.***					
CO3	***Tounderstandtheconceptofaudioandvideocompression.***					
CO4	***Tounderstandtheconceptofmultimediasynchronizationandvideoindexing.***					

Unit - I

MultimediaCommunication:Introduction,Multimedianetworks:Telephonenetworks,Datanetworks,ISDN,B-ISDN.MultimediaApplications:Interactiveapplicationsovertheinternetandentertainmentapplications. DigitizationPrinciples,RepresentationofText,Images,AudioandVideo.

Unit - II

TextCompression: Compressionprinciples,TextCompressiontechniques:StaticHuffmanCoding,Dynamic HuffmanCoding,ArithmeticCoding,LempelZivandLempelZivwelshcoding.

ImageCompression:Graphicsinterchangeformat,Taggedimagefileformat,JPEGindetail.

Unit - III

AudioCompression:DifferentialPulseCodeModulation,AdaptiveDifferentialPCM,AdaptivePredictivecoding,LinearpredictivecodingandMPEGaudiocoders,

VideoCompression:VideoCompressionprinciples,Frametypes,Motionestimationandcompensation,H.261, H.263

Unit - IV

MultimediaSynchronization: Basicdefinitionsandrequirements,TimestampingandPackarchitecture.

VideoIndexing:Basicsofcontentbasedimageretrievalandvideocontentrepresentation.

ReferenceBooks:

1. Multimediacommunications:FredHalsall;PearsonEducationAsia.
2. MultimediaSystems"byRalfSteinmetzandKlaraNahrstedt
3. MultimediaSystems,Standards,andNetworks"byA.PuriandT.Chen

ECE-430N	MIXED VLSI DESIGN

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Lecture	Tutorial	Practical	Theory	Sessionals	Total	Time
3	**0**	**0**	**75**	**25**	**100**	**3Hr.**
Purpose	*This course teaches how in real life applications both analog and digital circuits can implemented for various system design.*					
CourseOutcomes						
CO1	***To know mixed signal circuits like DAC, ADC, PLL etc.***					
CO2	***To gain knowledge on filter design in mixed signal mode.***					
CO3	***To acquire knowledge on design of different architectures in mixed signal***					

Unit-I

PHASE LOCKED LOOP

Characterization of a comparator, basic CMOS comparator design, analog multiplier design, PLL - simple PLL, charge-pump PLL, applications of PLL.

Unit- II

SAMPLING CIRCUITS

Basic sampling circuits for analog signal sampling, performance metrics of sampling circuits, different types of sampling switches. Sample-and-Hold circuit with miller capacitance.

Unit- III

D/A CONVERTER

Input/output characteristics of an ideal D/A converter, performance metrics of D/A converter, D/A converter in terms of voltage, current, and charge division or multiplication, switching functions to generate an analog output corresponding to a digital input.

Unit- IV

A/D CONVERTER

Input/output characteristics and quantization error of an A/D converter, performance metrics of pipelined architectures, Successive approximation architecture.

BOOKS:

1. S. M. Kang and Y. Leblebici, CMOS Digital Integrated Circuits : Analysis and Design, Third Edition, TMH, 2002.
2. Razavi, "Design of analog CMOS integrated circuits", McGraw Hill, Edition 2002.
3. Jacob Baker, "CMOS Mixed-Signal circuit design", IEEE Press, 2009.
4. Gregorian, Temes, "Analog MOS Integrated Circuit for signal processing", John Wiley & Sons, 1986.

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ECE-432N	MICROSTRIP ANTENNA					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
3	**0**	**0**	**75**	**25**	**100**	**3Hr.**
Purpose	*Tofamiliarizethestudentswiththeconceptsofbasic Antenna.*					
CourseOutcomes						
CO1	***TounderstandtheconceptofbasicAntenna.Systemandvarioustypesofapplications.***					
CO2	***Tounderstandtheconcept of microstrip antenna and its analytical modeling***					
CO3	***To understand the different designs of microstrip antenna***					
CO4	***To understand the applications of different designs of microstrip antenna***					

Unit-1

Micro Strip Radiator

Introduction, Microstrip Antenna Configurations, Feeding Techniques and Modeling of Microstrip Antenna, Radiation field, Surface wave and Photonic Bandgap Structures and Applications

Unit- 2

Analytical Modeling and Full Wave Analysis

Introduction, Transmission Line Model, Cavity model, Radiation Fields, Aperture and Mutual admittance, conductance. **Full wave analysis:** Input Impedance and Radiation efficiency, Radiation pattern, Mixed Potential Integral Equation Analysis, Greens function, Finite Difference Time-Domain Analysis.

Unit-3

Rectangular and Circular Microstrip Antenna

Introduction, Models for Rectangular Patch Antennas, Design Consideration for Rectangular Patch antennas, Tolerance Analysis, Mechanical Tuning, Quarter-wave Rectangular Patch Antenna, **Circular Microstrip Antenna:** Analysis of Circular disk, Cavity and Transmission line modeling of circular antennas.

Unit- 4

Circularly Polarized and Broadband Microstrip Antenna Design

Circular Polarization, Rectangular and Circular Circularly polarized Antennas, Power divider : T Junction and Wilkinson.
Effect of Substrate Parameter on Bandwidth, Selection of suitable Patch Shape, Feeding Techniques, MultimodingTechniques , Impedance Matching, Resistive Loading.

Textbook: Ramesh Garg, Prakash Bhartiya, InderBahl, ApisakIttipboon, "**Microstrip Antenna Design Handbook",** Artech House Boston, London.

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ECE-434N	STRATEGIC ELECTRONICS					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
3	**0**	**0**	**75**	**25**	**100**	**3Hr.**
CourseOutcomes						
CO1	***Studentswillbeawareofstate-oftheartinflexibleelectronics***					
CO2	***StudentsbeabletounderstandthefundamentalsofSmartStructureandMaterials***					
CO3	***Understandingbasicprinciplesoffabricationtechniquesusedforthefabricationoffuturisticflexibleelectronicdevices,structure,sensorsandtransducers.***					
CO4	***Understandthecharacterizationtechniquesusedinfuturisticelectronicdevices,smartmaterials,structures,etc.***					

Unit-I

Emergingflexibleelectronicstechnology,involvingnewmaterialsandprocessingtechniquessuchasamorphousandnanocrystallinesilicon,organicandpolymericsemiconductors,solutioncastfilmsofcarbonnanotubes,andgraphene.Realdevicearediscussedincludinghighspeedtransistors,photovoltaics,flexible flat-panel displays,etc.

Unit – II

StrainMeasuringTechniquesusingElectricalstraingauges,Types–Resistance–CapacitanceInductance–Wheatstonebridges–Pressuretransducers–Loadcells–TemperatureCompensation–StrainRosettes.SensingTechnology–TypesofSensors–PhysicalMeasurementusingPiezoElectricStrainmeasurement –InductivelyReadTransducers–TheLVOT–FiberopticTechniques.ChemicalandBio-ChemicalsensinginstructuralAssessment–Absorptivechemicalsensors–Spectroscopes–FibreOpticChemicalSensingSystemsandDistributedmeasurement.

Unit - III

Cleanroompractices,Photolithography,Ionimplantation,Diffusion,Oxidation,CVD-Physicalvapordeposition,epitaxy-etchingprocess.
BulkMicromanufacturing-surfacemicromachining–LIGA,Microsystempackagingmaterials-dielevel-devicelevel-systemlevel-packagingtechniques–diepreparation–surfacebonding-wirebonding-sealing.Introductiontoassembly,IntroductiontoMicro-systemdesign

Unit - IV

CharacterizationTechniques:QuantumwellsandThicknessmeasurementtechniques:Contact-stepheight,Optical-reflectanceandellipsometry,AFM,NanomaterialsCharacterizationtechniques:IV-CVElectrochemicalImpedance,FTIR,XRD,AFM,SEM,TEM,EDAXandinterpretationofresults.

Books:

1.FlexibleElectronics:MaterialsandApplications,Editors:**Wong**,WilliamS.,**Salleo**,Alberto(Eds.)2.BrainCulshaw–SmartStructureandMaterialsArtechHouse–Borton.London-1996.
3. MEMSandMicrosystemsDesignandManufacture"byTai-RanHsu.TataMcGraw-HillPublishingCompanyLtd
4. MarcFMadou,"FundamentalsofMicroFabrication",CRCPress,2ndEdition,2002.
5. SemiconductorMaterialandDeviceCharacterizationByDieterK.Schroder,WilleyPublications

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ECE-436N	COGNITIVERADIOS					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
3		**-**	**75**	**25**	**100**	**3**
Purpose	***Tounderstand theconcept of CognitiveRadioand Spectrumsharing***					
CourseOutcomes						
CO 1	*Conceptualize the CR andimplementationdetails*					
CO 2	*DesignCR for a specific application*					
CO 3	*Identify the challengesin the maintenance of CR*					
CO 4	*Analyse the transmitterandreceiver architectures*					

Unit-I

RFSystemDesign–Introduction-NoiseandChannelCapacity-LinkBudget-ReceiverRequirements-MulticarrierPowerAmplifiers-SignalProcessingCapacityTradeoff.

Unit-II

CRArchitecture-CognitiveRadioArchitecture,DynamicAccessSpectrum,SpectrumEfficiency,SpectrumEfficiencygaininSDRandCR,SpectrumUsage,SDRasaplatformforCR,OFDMasPHY layer,OFDMModulator,OFDMDemodulator,OFDMBandwidth,Benefitsof OFDM in CR, SpectrumSensing in CR,CRNetwork

Unit-III

SmartAntennasUsingSoftwareRadio-Introduction-3GsmartAntennaRequirements PhasedAntennaArrayTheory-ApplyingSoftwareRadioPrinciplestoAntennaSystems SmartAntennaArchitectures-OptimumCombining/AdaptiveArrays-DOAArrays-BeamFormingforCDMA-DownlinkBeam Forming.

Unit-IV

ApplicationofSDR-ApplicationofSDRinAdvanceCommunicationSystem-CaseStudy,ChallengesandIssues,Implementation,ParameterEstimation–Environment,Location,otherfactors,VerticalHandoff,NetworkInteroperability.

TextBooks:

1. Jeffrey.H.Reed,SoftwareRadio:AModern Approach toRadioEngineering , Pearson ,ReferenceBooks:1.MarkusDillinger,KambizMadani,NancyAlonistioti,SoftwareDefinedRadio : Architectures ,Systems andFunctions,Wiley
2. Tony .J. Rouphael ,RF and DSPforSDR, Elsevier NewnessPress,2008
3. Dr.TajStruman,Evaluation of SDR –Main Document
4. SDR–Handbook,8thEdition,PENTEK5.Brucea.Fette,CognitiveRadioTechnology,Newness,Elsevier.