3rd Semester

AS-201N	MATHEMATICS-III					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 hrs**

UNIT-I

Fourier Analysis

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

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

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:

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.

MATHEMATICS-III (AS-201N)														
	Cos													
AS-201N.1	Explain the non-periodic phenomena and the techniques to develop periodic functions as Fourier series													
AS-201N.2	Demonstrate the concept of Fourier integrals for non periodic functions and their applications for solution of initial and boundary value problems													
AS-201N.3	Analyze partial differential equations and conclude various methods to their solutions.													
AS-201N.4	Interpret the linear programming problems and its solutions by using various methods													
AS-201N.5	Understand the concept of complex functions and its applications to engineering problems.													
AS-201N.6	Illustrate probability distributions and their applications in various engineering problems													
				CO-PO and CO-PSO mapping										
	MATHEMATICS-III (AS-201N)													
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**P09**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
AS-201N.1	3	2	2	1	1	-	-	1	1	1	1	2	1	1
AS-201N.2	3	2	1	1	2	-	-	-	-	-	-	2	1	1
AS-201N.3	2	3	1	2	1	-	-	-	-	-	-	2	1	1
AS-201N.4	3	3	2	3	2	-	-	-	-	-	-	2	1	1
AS-201N.5	3	2	2	1	1	1	1	-	-	-	-	1	1	1
AS-201N.6	3	3	2	2	1	-	-	-	-	2	1	3	1	1
AVG	**2.83**	**2.5**	**1.67**	**1.67**	**1.33**	**1.00**	**1.00**	**1.0**	**1.00**	**1.50**	**1.00**	**2.00**	**1.00**	**1.00**

ECE-201N	Signals and Systems					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**

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 under sampling, reconstruction of a signal from 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 of laplace 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.

SIGNAL & SYSTEM (ECE-201N)	
Cos	**Student will be able to**
ECE-201N.1	Classify different types of signals and systems.
ECE-201N.2	Understand the concept of Random Variable and analysis of systems using convolution technique.
ECE-201N.3	Make use of sampling phenomenon to convert continuous time signal into discrete signal.
ECE-201N.4	Illustrate spectral analysis of continuous and discrete time signals using Fourier Series.
ECE-201N.5	Examine Fourier Transform technique to analyze continuous-time and discrete-time systems.
ECE-201N.6	Apply Laplace Transform technique to analyze continuous-time systems.

CO-PO and CO-PSO Mapping

	SIGNAL & SYSTEM (ECE-201N)													
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**P09**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
ECE-201N.1	3	1	1	-	2	-	-	-	2	-	-	2	3	1
ECE-201N.2	3	3	1	-	2	-	-	-	2	-	-	2	2	1
ECE-201N.3	3	1	1	-	2	-	-	-	2	-	-	2	2	1
ECE-201N.4	3	3	1	-	2	-	-	-	2	-	-	2	3	1
ECE-201N.5	3	1	1	-	2	-	-	-	2	-	-	2	3	1
ECE-201N.6	3	1	1	-	2	-	-	-	2	-	-	2	3	1
AVG	**3.00**	**1.67**	**1.00**	-	**2.00**	-	-	-	**2.00**	-	-	**2.00**	**2.67**	**1.00**

ECE -203N	Electronic Devices					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**

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, Dhrubes Biswas 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.

ELECTRONIC DEVICES (ECE-203N)														
	Cos													
ECE-203N.1	Explain concept of carrier transport phenomena in semiconductors devices and Fermi energy level position variation with doping													
ECE-203N.2	Justify the operation of different diodes working along with V-I characteristics													
ECE-203N.3	Explain the working mechanism of Bipolar Junction Transistor in various configurations with characteristics.													
ECE-203N.4	Examine working of transistor amplifier using hybrid model to find out various parameters like I/O impedance, V-I gain													
ECE-203N.5	Analyze the non ideal behavior of FET devices regarding their construction, operation, voltage current characteristics using N channel and P channel.													
ECE-203N.6	Design different kind of regulated power supplies.													
				CO-PO and CO-PSO mapping										
	ELECTRONIC DEVICES (ECE-203 N)													
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**P09**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
ECE-203N.1	3	2	2	1	-	-	-	-	-	-	-	2	3	1
ECE-203N.2	2	2	2	3	-	-	-	-	-	-	-	1	2	2
ECE-203N.3	3	2	2	1	-	-	-	-	-	-	-	1	3	1
ECE-203N.4	3	2	1	1	-	-	-	-	-	-	-	-	2	1
ECE-203N.5	3	3	2	1	-	-	-	-	-	-	-	2	3	1
ECE-203N.6	2	2	3	1	2	-	-	-	1	-	1	2	3	2
AVG	**2.67**	**2.16**	**2.00**	**1.33**	**2.00**	**-**	**-**	**-**	**1.00**	**-**	**1.00**	**1.66**	**2.67**	**1.33**

ECE-205N	Network Analysis and Synthesis					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**

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

NETWORK ANALYSIS & SYNTHESIS(ECE-205N)	
	Cos
ECE-205N.1	Apply the concept of graph theory on network topologies.
ECE-205N.2	Analyze the network in the time domain and frequency domain for different singular functions.
ECE-205N.3	Evaluate the time domain behavior from the pole-zero plots.
ECE-205N.4	Utilize the characteristics & parameters of two port networks.
ECE-205N.5	Illustrate the concept of passive filters and one port networks.
ECE-205N.6	Design the passive filters and one port networks for given problems.

CO-PO and CO-PSO mapping

	NETWORK ANALYSIS & SYNTHESIS(ECE-205N)													
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**P09**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**
ECE-205N.1	3	1	1	-	-	-	-	1	-	-	-	-	3	-
ECE-205N.2	1	3	1	3	-	-	-	-	-	-	-	-	3	-
ECE-205N.3	1	1	3	-	-	-	-	-	-	-	-	-	3	-
ECE-205N.4	3	1	1	-	-	-	-	1	2	-	-	2	3	-
ECE-205N.5	3	1	1	-	-	-	-	-	-	-	-	-	3	-
ECE-205N.6	1	1	3	-	-	-	-	1	2	-	-	2	3	2
AVG	**2.00**	**1.33**	**1.67**	**3.00**	**-**	**-**	**-**	**1.00**	**2.00**	**-**	**-**	**2.00**	**3.00**	**2.00**

ECE-207N	Digital Electronics					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**

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.

Combinational Design using Gates: Combinational 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

DIGITAL ELECTRONICS(ECE-207N)														
	COs													
ECE-207N.1	Apply boolean algebra to understand binary logic and logic circuits.													
ECE-207N.2	Construct the basic combinational circuits and verify their functionalities.													
ECE-207N.3	Understand the operational and electrical characteristics of logic families.													
ECE-207N.4	Design and analysis of synchronous and asynchronous sequential circuits using flip flops.													
ECE-207N.5	Classify various types of memories with their operations.													
ECE-207N.6	Implement combinational logic circuits using various programmable logic devices.													
				CO-PO and CO-PSO mapping										
	DIGITAL ELECTRONICS(ECE-207N)													
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**P09**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
ECE-207N.1	3	2	2	1	-	-	-	-	-	-	-	-	3	-
ECE-207N.2	3	3	3	2	-	-	-	-	-	-	-	-	3	-
ECE-207N.3	3	2	3	2	-	-	-	-	-	-	-	-	3	2
ECE-207N.4	3	3	3	3	-	-	-	-	-	-	-	-	3	-
ECE-207N.5	3	1	2	1	-	-	-	-	-	-	-	-	3	2
ECE-207N.6	2	2	3	2	-	-	-	-	-	-	-	-	3	-
AVG	**2.83**	**2.16**	**2.67**	**1.83**	-	-	-	-	-	-	-	-	**3.00**	**2.00**

ECE-209N	Analog Communications					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**

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, Band pass 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 ofCommunication 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.

ANALOG COMMUNICATION (ECE-209N)														
	COs													
ECE-209N.1	Describe different types of noise and predict its effect on various analog communication systems.													
ECE-209N.2	Understand the concept of amplitude and angle modulation and analyse their voltage, power and current relations.													
ECE-209N.3	Illustrate and classify various AM transmission and reception techniques.													
ECE-209N.4	Outline the different frequency modulation transmission and reception methods and evaluate with various techniques.													
ECE-209N.5	Explain the various SSB transmission and reception techniques with applications.													
ECE-209N.6	Classify the Analog pulse modulation techniques and comparative analysis amongst them.													
				CO-PO and CO-PSO mapping										
	ANALOG COMMUNICATION (ECE-209N)													
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**P09**	**PO 10**	**PO 11**	**PO12**	**PSO1**	**PSO2**
ECE-209N.1	3	2	1	2	-	-	-	-	-	-	-	-	1	-
ECE-209N.2	3	2	1	3	-	-	-	-	-	-	-	-	-	-
ECE-209N.3	3	2	1	1	3	-	-	3	2	-	-	2	2	2
ECE-209N.4	3	3	2	1	3	-	-	3	2	-	-	2	2	2
ECE-209N.5	3	2	2	1	-	-	-	-	-	-	-	-	1	1
ECE-209N.6	3	2	1	3	3	-	-	3	-	-	-	2	2	1
AVG	**3.00**	**2.16**	**1.33**	**1.83**	**3.00**	-	-	**3.00**	**2.00**	-	-	**2.00**	**1.6**	**1.5**

4th semester

AS-206N	NUMERICAL ANALYSIS					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
4	**0**	**0**	**75**	**25**	**100**	**3 hrs**

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 1/3rdand 3/8thrules, 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.

NUMERICAL ANALYSIS (AS-206N)													
	COs												
AS-206N.1	Develop techniques of solution of nonlinear equations												
AS-206N.2	Understanding the concept of linear system and its solutions												
AS-206N.3	Demonstrate various type of interpolations and their applications.												
AS-206N.4	Constructing the numerical techniques of Differentiation and integration												
AS-206N.5	Discuss the techniques of numerical solution of differential equations												
AS-206N.6	Formulate the technique for fitting of curves												
				CO-PO and CO-PSO mapping									
	NUMERICAL ANALYSIS (AS-206N)												
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**P09**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
AS-206N.1	2	2	3	1	1	2	2	1	1	1	1	2	1	1
AS-206N.2	3	2	1	1	2	1	1	-	1	1	1	2	1	1
AS-206N.3	3	2	1	1	1	1	2	-	1	1	1	2	1	1
AS-206N.4	3	2	2	2	2	1	-	-	1	1	1	1	1	1
AS-206N.5	3	2	2	1	1	1	1	-	1	-	-	1	1	1
AS-206N.6	3	2	2	2	1	1	1	-	1	2	1	2	1	1
AVG	**2.83**	**2.00**	**1.83**	**1.33**	**1.33**	**1.4**	**1.4**	**1.00**	**1.0**	**1.20**	**1.00**	**1.67**	**1.00**	**1.00**

ECE-202N	Data Structures & Algorithms					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**

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

DATA STRUCTURE ALGORITHMS (ECE-202N)													
	COs												
ECE-202N.1	Define various data structures like array, linked list.												
ECE-202N.2	Explain operations like searching, insertion, and deletion, traversing mechanism on various data structures.												
ECE-202N.3	Construct Non Linear data structure using Linear data structures.												
ECE-202N.4	Analyze the complexity of given algorithms.												
ECE-202N.5	Implement appropriate sorting/searching technique.												
ECE-202N.6	Design advance data structure using Non Linear data structure.												
				CO-PO and CO-PSO Mapping									
	DATA STRUCTURE ALGORITHMS (ECE-202N)												
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**P09**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**
ECE-202N.1	3	-	-	-	-	-	-	1	2	1	1	1	-	-
ECE-202N.2	3	2	-	-	-	-	-	1	2	1	1	1	-	-
ECE-202N.3	3	3	2	-	-	-	-	2	2	1	1	2	-	-
ECE-202N.4	3	3	2	-	-	-	-	2	2	1	1	2	2	2
ECE-202N.5	3	3	3	2	-	-	-	2	2	1	1	2	2	2
ECE-202N.6	3	3	3	3	-	-	-	2	2	1	1	2	3	3
AVG	**3.00**	**2.80**	**2.50**	**2.50**	-	-	-	**1.67**	**2.00**	**1.00**	**1.00**	**1.67**	**2.33**	**2.33**

ECE-204N	Electronics Measurements and Instruments					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**

Unit-I

Measurement and Error: Functional elements and generalized configuration of ameasuring Instrument, Characteristics of instruments, errors in measurements and their statisticalanalysis.

Measurement of Resistance: Wheat stone bridge, Carey-Foster Bridge, Kelvin doublebridge, 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 ofOp-Amp parameters.

Digital Instruments: Digital Indicating Instruments, Comparison with analog type, digitaldisplay 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.

Electronics Measurements and Instruments													
	COs												
ECE-204N.1	Explain the usage of Data Acquisition systems in communication												
ECE-204N.2	Apply the knowledge of voltage indicating and recording devices such as CRO to measure frequency, phase with oscilloscope												
ECE-204N.3	Examine various electronic instruments, digital instruments and transducers for measurement of various parametes, to be able to use in industrial applications												
ECE-204N.4	Compare the performance of various dc bridges for measurement of resistance and ac bridges for measurement of inductance and capacitance												
				CO-PO and CO-PSO mapping									
	Electronics Measurements and Instruments (ECE-204N)												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**P09**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
ECE-204N.1	3	2	1	-	-	-	-	-	-	-	-	-	2	-
ECE-204N.2	3	2	2	1	3		1	2	2	-	1		2	-
ECE-204N.3	2	3	2	2	-	1	-	-	-	-	2	1	-	2
ECE-204N.4	3	2	1	1	-	-	-	-	-	-	-	-	-	2
AVG	**2.75**	**2.25**	**1.50**	**1.33**	**3.00**	**1.00**	**1.00**	**2.00**	**2.00**	**-**	**1.50**	**1.00**	**2.00**	**2.00**

ECE-206N	Electromagnetic Theory					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**

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.

ELECTROMAGNETIC THEORY (ECE-206N)														
	Cos													
ECE-206N.1	Summarize the concept of Vector Calculus and Coordinate Systems.													
ECE-206N.2	Interpret the concept of Electrostatic Field with its application and properties.													
ECE-206N.3	Understand the concept of Magneto-static Field and Maxwell Equation with its application and properties.													
ECE-206N.4	Apply the Maxwell Equation to analyse uniform plane waves and their propagation in different mediums.													
ECE-206N.5	Explain the basic fundamentals of Transmission Lines and its properties.													
ECE-206N.6	Analyze the different modes of wave propagation in waveguides.													
				CO-PO and CO-PSO Mapping										
	ELECTROMAGNETIC THEORY (EC-206N)													
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**P09**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
ECE-206N.1	3	2	1	-	-	-	-	-	-	-	-	1	3	1
ECE-206N.2	3	1	1	-	1	-	-	-	-	-	-	1	2	1
ECE-206N.3	3	1	1	-	1	-	-	-	-	-	-	1	2	1
ECE-206N.4	3	2	1	-	1	-	-	-	-	-	-	1	2	1
ECE-206N.5	3	3	1	1	-	-	-	-	-	-	-	1	2	1
ECE-206N.6	3	3	1	1	-	-	-	-	-	-	-	1	2	1
AVG	**3.00**	**2.00**	**1.00**	**1.00**	**1.00**	-	-	-	-	-	-	**1.00**	**2.16**	**1.00**

ECE-208N	Analog Electronics					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**

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

ANALOG ELECTRONICS (ECE-208N)														
	Cos													
ECE-208N.1	Illustrate the basics concept of BJT and FET													
ECE-208N.2	Interpret and analyze BJT and FET amplifiers for small signals and high frequency signals.													
ECE-208N.3	Implement the transistor circuits in field of high and low frequency.													
ECE-208N.4	Analyze the feedback amplifiers in terms of their input and output impedance													
ECE-208N.5	Design various circuits by using both op-amp and BJT													
				CO-PO and CO-PSO mapping										
	ANALOG ELECTRONICS (ECE-208N)													
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**P09**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
ECE-208N.1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
ECE-208N.2	3	3	-	-	-	-	-	-	-	-	-	-	3	-
ECE-208N.3	3	3	3	2	-	-	-	-	-	-	-	-	3	-
ECE-208N.4	3	3	3	2	-	-	-	2	-	-	-	2	3	3
ECE-208N.5	3	3	3	2	-	-	-	2	-	-	-	2	3	3
AVG	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**2**	**3**	**3**

ECE-210N	Computer Architecture & Organization					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**

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.

COMPUTER ARCHITECTURE AND ORGANIZATION (ECE-210 N)														
	COs													
ECE-210N.1	Recall the basic concepts of computer hardware and software													
ECE-210N.2	Classify and explain the instruction set and programming concepts in CPU													
ECE-210N.3	Illustrate the methods of control unit design													
ECE-210N.4	Apply the digital arithmetic concepts for the design of ALU.													
ECE-210N.5	Classify different types of memory and Analyze some of the design issues in terms of speed, technology, cost, performance.													
ECE-210N.6	Analyze the techniques like pipelining, parallel processing, RISC used in system organization and access their performance													
				CO-PO and CO-PSO mapping										
	COMPUTER ARCHITECTURE AND ORGANIZATION (ECE-210 N)													
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**P0 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
ECE-210N.1	3	2	2	2	-	-	-	-	-	-	-	-	-	-
ECE-210N.2	3	3	1	2	-	-	-	-	-	-	-	-	3	-
ECE-210N.3	3	2	2	2	-	-	-	-	-	-	-	-	-	-
ECE-210N.4	3	3	3	2	-	-	-	-	-	-	-	-	3	-
ECE-210N.5	2	3	2	2	-	-	-	1	1	-	-	1	3	2
ECE-210N.6	2	3	2	2	-	-	-	1	1	-	-	1	3	2
AVG	**2.67**	**2.67**	**2.00**	**2.00**	**-**	**-**	**-**	**1.00**	**1.00**	**-**	**-**	**1.00**	**3.00**	**2.00**

5th semester

ECE-301N	Microprocessor & Interfacing					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**

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.

MICROPROCESSOR & INTERFACING (ECE-301N)														
	COs													
ECE-301N.1	Recall the basic architecture of microprocessors and understand its components.													
ECE-301N.2	Understand the detailed architecture of microprocessor (8085,8086).													
ECE-301N.3	Classify and explain the instruction set and programming concepts in assembly language.													
ECE-301N.4	Apply the programming tools to solve different problems in assembly language.													
ECE-301N.5	Interface peripherals with microprocessor													
ECE-301N.6	Design the systems /models based on microprocessor.													
				CO-PO and CO-PSO mapping										
	MICROPROCESSOR & INTERFACING (ECE-301N)													
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**P09**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**
ECE-301N.1	3	2	2	-	-	-	-	-	1	-	-	-	3	1
ECE-301N.2	3	2	2	-	-	-	-	-	1	-	-	-	2	1
ECE-301N.3	2	3	2	-	-	-	-	-	1	-		1	2	1
ECE-301N.4	3	3	2		1			1	1	-	-	-	2	1
ECE-301N.5	1	3	3	-	1	-	-	1	1	-	-	-	2	1
ECE-301N.6	1	1	3	3	1	-	-	1	1	2		2	2	1
AVG	**2.16**	**2.33**	**2.33**	**3.00**	**1.00**	**-**	**-**	**1.00**	**1.00**	**2.00**		**1.5**	**2.16**	**1.00**

HS-303N	Business Intelligence & Entrepreneurship					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**0**	**0**	**75**	**25**	**100**	**3 Hr.**

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.

BUSINESS INTELLIGENCE & ENTREPRENEURSHIP (HS-303 N)														
	COs													
HS-303N.1	A broad operational understanding about the Entrepreneurs and analyze the competences needed to become an entrepreneur.													
HS-303N.2	Obtain a practical insights into the management, opportunity search, identification of a product, market feasibility studies.													
HS-303N.3	Build business idea, export marketing and product identification.													
HS-303N.4	Apply different financial assistance for establishing small industrial units.													
HS-303N.5	Adapt their awareness and deliberately practice the skills and disciplines necessary to increase confidence and improve communication and problem-solving skills.													
HS-303N.6	Analyze the function of the entrepreneur in the successful, commercial application of innovation.													
				CO-PO and CO-PSO mapping										
	BUSINESS INTELLIGENCE & ENTREPRENEURSHIP (HS-303 N)													
CO	**PO 1**	**PO2**	**PO 3**	**PO 4**	**PO5**	**PO6**	**PO7**	**PO8**	**P09**	**PO1 0**	**PO1 1**	**PO12**	**PSO 1**	**PSO 2**
HS-303N.1	3	2	1	-	-	-	-	2	3	-	-	-	1	1
HS-303N.2	3	2	3	2	3	-	-	-	2	-	3	-	1	1
HS-303N.3	3	2	2	1	-	-	-	2	-	2	-	-	1	1
HS-303N.4	-	-	1	-	1	-	2	-	3	3	3	-	1	1
HS-303N.5	-	-	-	2	2	3	-	2	1	-	3	-	1	1
HS-303N.6	-	1	-	1	1	-	-	2	-	-	2	-	1	1
AVG	**3.00**	**1.75**	**1.75**	**1.5**	**1.75**	**3.00**	**2.00**	**2.00**	**2.25**	**2.50**	**2.75**		**1.00**	**1.00**

ECE-303N	Antenna & Wave Propagation					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**

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

ANTENNA & WAVE PROPAGATION (ECE-303N)	
Cos	**Student will be able to**
ECE-303N.1	Understand the performance parameters of antenna and apply them to calculate performance of antenna.
ECE-303N.2	Applying the mechanism for calculating the radiated fields of antennas.
ECE-303N.3	Analyzing the requirements, principals, and structures of different antennas.
ECE-303N.4	Designing microstrip patch antennas for different frequencies.
ECE-303N.5	Classify different modes of wave propagation.
ECE-303N.6	Illustrate the effects of atmosphere on radio wave propagation.

CO-PO and CO-PSO mapping

ANTENNA & WAVE PROPAGATION (ECE-303N)

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**P09**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
ECE-303N.1	3	2	2	-	1	1	-	1	-	-	-	-	2	-
ECE-303N.2	3	2	1	-	2	1	1	1	-	-	-	1	3	1
ECE-303N.3	2	3	1	1	1	1	1	1	-	-	-	-	2	1
ECE-303N.4	2	2	3	1	3	1	1	2	-	-	-	1	2	1
ECE-303N.5	3	2	2	-	-	-	-	-	-	-	-	1	1	-
ECE-303N.6	2	3	2	-	-	-	1	-	-	-	-	-	1	1
AVG	**2.5**	**2.33**	**1.83**	**1.00**	**1.75**	**1.00**	**1.00**	**1.25**	-	-	-	**1.00**	**1.83**	**1.00**

ECE-305N	VLSI Technology					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**

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.

VLSI TECHNOLOGY (ECE-305 N)														
	COs													
ECE-305N.1	Understand the basic concepts in VLSI, purification process of Silicon and fabrication processes involved in Integrated Circuits													
ECE-305N.2	Classify clean room standards on the basis of number and size of particles per volume of air.													
ECE-305N.3	Apply existing mathematical models, to estimate the thickness of oxide layer, etch rate, deposition rate.													
ECE-305N.4	Compare processes of doping and assess the suitability of a process for fabrication.													
ECE-305N.5	Design the fabrication steps for a device with the knowledge of fabrication processes													
				CO-PO and CO-PSO mapping										
	VLSI (ECE-305N)													
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
ECE-305N.1	3	2	2	2	-	-	-	-	-	-	-	-	-	-
ECE-305N.2	3	2	2	2	-	-	-	2	-	-	-	-	-	-
ECE-305N.3	3	3	2	1	-	-	-	-	-	-	-	-	2	-
ECE-305N.4	3	2	1	1	-	-	-	-	-	-	-	-	-	-
ECE-305N.5	2	1	3	1	-	-	-	-	-	-	-	-	2	-
AVG	**2.80**	**2.00**	**2.00**	**1.40**	**-**	**-**	**-**	**2.00**	**-**	**-**	**-**	**-**	**2.00**	**-**

CSE-304N	Essentials of Information Technology					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**0**		**75**	**25**	**100**	**3 Hr.**

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.

ESSENTIALS OF INFORMATION TECHNOLOGY (CSE-304N)														
	COs													
CSE-304N.1	Define the concepts of Data Structures and object oriented programming.													
CSE-304N.2	Explain the solution using various efficient and reliable algorithms.													
CSE-304N.3	Design the use case diagram and class diagrams for real life problems.													
CSE-304N.4	Develop artifacts using common quality standard.													
CSE-304N.5	Design data store using RDBMS concepts.													
				CO-PO and CO-PSO mapping										
	ESSENTIALS OF INFORMATION TECHNOLOGY (CSE-304N)													
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**P09**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**
CSE-304N.1	3	-	-	-	-	1	1	-	2	2	1	1	-	-
CSE-304N.2	3	2	-	-	-	1	1	-	2	2	1	1	-	2
CSE-304N.3	3	3	2	-	-	1	1	-	2	2	1	2	-	-
CSE-304N.4	3	3	2	-	-	2	1	2	2	2	1	2	-	-
CSE-304N.5	3	3	3	2	2	2	1	-	2	2	1	2	-	-
AVG	**3.00**	**2.75**	**2.33**	**2.00**	**2.00**	**1.40**	**1.00**	**2.00**	**2.00**	**2.00**	**1.00**	**1.60**	**-**	**2.00**

ECE-307N	Control System Engineering					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**

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.

CONTROL SYSTEM ENGINEERING (ECE-307N)														
	COs													
ECE-307N.1	Applying the mathematical and graphical methods to simplify complex control system.													
ECE-307N.2	Evaluate the response and error analysis of system in time domain.													
ECE-307N.3	Determine the conditions for stability of a system in time domain through routh-hurwitz and root locus technique.													
ECE-307N.4	Analyze performance characteristics of a system in frequency domain.													
ECE-307N.5	Examine the system with state variable approach.													
ECE-307N.6	Apply the compensation technique to design a compensator with desired specification.													
				CO-PO and CO-PSO mapping										
	CONTROL SYSTEM ENGINEERING (ECE-307N)													
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**P09**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
ECE-307N.1	3	2	1	-	-	-	-	-	-	-	-	-	3	1
ECE-307N.2	3	2	2	-	-	-	-	-	-	-	-	-	3	1
ECE-307N.3	3	2	1	-	1	-	-	-	-	-	-	-	3	1
ECE-307N.4	2	3	2	-	1	-	-	-	-	-	-	-	3	1
ECE-307N.5	2	3	2	-	-	-	-	-	-	-	-	1	3	1
ECE-307N.6	3	1	3	1	-	-	-	-	-	-	-	1	3	1
AVG	**2.67**	**2.16**	**1.83**	**1.00**	**1.00**	-	-	-	-	-	-	**1.00**	**3.00**	**1.00**

6th semester

ECE-302N	Digital Signal Processing					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**

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

DIGITAL SIGNAL PROCESSING (ECE-302N)													
	COs												
ECE-302N.1	Explain the significance of Z Transform and Fourier Transform in analysis of LTI system, Goertzel algorithm, Chirp Z-transform(Understanding)												
ECE-302N.2	Demonstrate the frequency domain of signal using DFT and causality, stability properties of LTI system by applying Z Transform(Applying)												
ECE-302N.3	Construct various types of structures for FIR and IIR filter of Discrete Time Systems. (Applying)												
ECE-302N.4	Analyze working mechanism of FIR and IIR filters (Analyzing)												
ECE-302N.5	Compare various aspects of Butterworth, Chebyshev and Elliptical filter design technique (Evaluation)												
ECE-302N.6	Design IIR and FIR filter by applying knowledge of various techniques. (Creating)												
				CO-PO and CO-PSO mapping									
	DIGITAL SIGNAL PROCESSING (ECE-302N)												
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**P0 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
ECE-302N.1	3	2	3	1	2		-	-	-	-	-	1	2	1
ECE-302N.2	3	3	2	2	2	-	-	-	-	-	-	-	2	1
ECE-302N.3	2	2	3	1	-	-	-	-	-	-	-	-	2	-
ECE-302N.4	3	3	3	2	1	1	-	-	-	-	-	1	2	2
ECE-302N.5	3	3	2	1	2	-	-	-	-	-	-	2	2	1
ECE-302N.6	3	3	3	2	3	1	-	-	-	-	-	2	2	3
AVG	**2.83**	**2.66**	**2.66**	**1.5**	**2.00**	**1.00**	**-**	**-**	**-**	**-**	**-**	**1.50**	**2.00**	**1.60**

ECE-304N	Digital Design Using Verilog					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**

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.

DIGITAL DESIGN USING VERILOG (ECE-304 N)													
	COs												
ECE-304 N.1	Understand the constructs and conventions of the Verilog HDL programming.												
ECE-304 N.2	Differentiate between the structural, register-transfer level (RTL), and algorithmic levels of Abstraction for modeling digital hardware systems.												
ECE-304 N.3	Design and modeling of combinational and sequential digital systems (Finite State Machines)												
ECE-304 N.4	Apply the concept of test-benches to create testing behavioral environments for simulation based verification.												
ECE-304 N.5	Implement the concepts of UDPs , tasks, function and compiler directives to improve the design.												
				CO-PO and CO-PSO mapping									
	DIGITAL DESIGN USING VERILOG (ECE-304N)												
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**P0 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**
ECE-304N.1	3	2	2	2	2	-	-	-	-	-	-	-	-	-
ECE-304N.2	3	2	1	1	2	-	-	-	-	-	-	-	-	-
ECE-304N.3	3	2	2	2	3	-	-	-	-	-	-	-	3	2
ECE-304N.4	3	2	1	2	3	-	-	2	-	-	-	-	3	3
ECE 304N.5	2	1	3	1	3	-	-	-	-	-	-	-	-	-
AVG	**2.20**	**1.80**	**1.80**	**1.60**	**2.60**	**-**	**-**	**2.00**	**-**	**-**	**-**	**-**	**3.00**	**2.50**

ECE-306N	Digital Communication					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**

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 distortion less 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.

DIGITAL COMMUNICATION (ECE-306N)														
	COs													
ECE-306N.1	Illustrate information theory and analyze various error-correcting techniques .													
ECE-306N.2	Analyze the importance of Synchronisation in Communication System.													
ECE-306N.3	Evaluate the performance of PCM, DPCM and DM in a digital communication system.													
ECE-306N.4	Compare various digital modulation techniques.													
ECE-306N.5	Examine various Detection Related Problems in Digital Communication Systems.													
				CO-PO and CO-PSO mapping										
	DIGITAL COMMUNICATION (ECE-306N)													
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**P09**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
ECE-306N.1	3	2	2	1	1	-	-	-	-	-	-	2	3	1
ECE-306N.2	2	3	2	-	-	-	-	-	-	-	-	-	1	1
ECE-306N.3	2	3	2	-	1	-	-	-	2	1	-	-	2	1
ECE-306N.4	2	3	2	1	1	-	-	-	2	1	-	2	2	1
ECE-306N.5	2	3	2	-	-	-	-	-	-	-	-	1	2	1
AVG	**2.20**	**2.80**	**2.00**	**1.00**	**1.00**	**-**	**-**	**-**	**2.00**	**1.00**	**-**	**1.67**	**2.00**	**1.00**

HS-302N	Fundamentals of Management					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
4	**0**	**0**	**75**	**25**	**100**	**3 Hr.**

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.

FUNDAMENTALS OF MANAGEMENT (HS-302N)	
	Cos
HS-302N.1	Explain the management as a discipline and illustrate the practical understanding of the different approaches to management and role of a business manager.
HS-302N.2	Analyze the business planning process and techniques and organize its different functions.
HS-302N.3	Make use of various concepts of staffing in order to create understanding of how to get the right people for the organisation.
HS-302N.4	Illustrate the importance of communication, motivation and leadership to effectively deal with workforce in order to get the optimum outcomes.
HS-302N.5	Assess and minimise the gap between expected and actual performance in an organisation.
HS-302N.6	Elaborate about social responsibility of conducting business and organisation's functional areas.

CO-PO and CO-PSO mapping

	FUNDAMENTALS OF MANAGEMENT (HS-302N)													
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**P0 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
HS-302N.1	3	2	1	-	-	-	-	2	3	-	-	1	1	1
HS-302N.2	-	3	2	2	3	-	-	-	2	-	3	3	1	2
HS-302N.3	-	3	2	1	-	-	-	2	-	2	-	1	-	-
HS-302N.4	-	3	1	-	1	-	2	-	3	3	3	3	-	-
HS-302N.5	-	3	2	3	3	-	1	1	-	-	-	2	2	2
HS-302N.6	-	-	3	2	2	3	3	3	-	2	3	2	2	-
AVG	**3.00**	**2.80**	**1.83**	**2.00**	**2.25**	**3.00**	**2.00**	**2.00**	**2.67**	**2.33**	**3.00**	**2.00**	**1.50**	**1.67**

ECE-308N	Computer Communication Networks					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessional**	**Total**	**Time**
3	**1**	**0**	**75**	**25**	**100**	**3 Hr.**

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

COMPUTER COMMUNICATION NETWORKS (ECE-308N)														
	COs													
ECE-308N.1	Define and explain concept of computer networks .													
ECE-308N.2	Compare OSI model and TCP/IP model.													
ECE-308N.3	Illustrate the process of data link layer and medium access sublayer.													
ECE-308N.4	Analyze the concept and design issue of network, transport and session layer.													
ECE-308N.5	Evaluate the cryptography and data compression technique .													
ECE-308N.6	Analyze the concept and design issue of application layer.													
				CO-PO and CO-PSO mapping										
	COMPUTER COMMUNICATION NETWORKS (ECE-308N)													
CO	**PO1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**P09**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**
ECE-308N.1	3	2	-	-	-	-	-	-	-	-	-	-	1	-
ECE-308N.2	3	3	1	-	-	-	-	-	-	1	-	1	1	1
ECE-308N.3	3	2	1	3	-	-	-	-	-	1	-	3	1	1
ECE-308N.4	2	3	3	2	-	-	-	-	-	1	-	1	1	2
ECE-308N.5	3	2	1	1	-	-	-	-	-	2	-	2	1	-
ECE-308N.6	2	3	-	2	-	-	-	-	-	1	-	3	1	2
AVG	**2.67**	**2.50**	**1.50**	**2.00**	**-**	**-**	**-**	**-**	**-**	**1.20**	**-**	**2.00**	**1.00**	**1.50**

7th Semester

ECE-401N	MICROCONTROLLER AND EMBEDDED SYSTEM DESIGN					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
3	**0**	**0**	**75**	**25**	**100**	**3 Hr.**

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. Myke Predko, "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"-2nd nd. McGraw-Hill Companies.
4. Intel's manual on "Embedded Microcontrollers".
5. Myke Predko, "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.

MICROCONTROLLER AND EMBEDDED SYSTEM DESIGN (ECE-401N)														
	COs													
ECE-401N.1	Recall the basic architecture of microcontrollers & microprocessors and understand the term embedded systems and its components.													
ECE-401N.2	Understand the detailed architecture of microcontrollers (8051,PIC16,AVR,ARM).													
ECE-401N.3	Classify and explain the instruction set and programming concepts in C and assembly language.													
ECE-401N.4	Apply the programming tools to solve different problems in C and assembly language.													
ECE-401N.5	Interface peripherals with microcontrollers.													
ECE-401N.6	Design the systems /models based on microcontrollers.													
				CO-PO and CO-PSO mapping										
	MICROCONTROLLER AND EMBEDDED SYSTEM DESIGN (ECE-401N)													
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**P09**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
ECE-401N.1	3	-	-	-	-	-	-	-	-	-	-	1	3	-
ECE-401N.2	3	-	-	-	-	-	-	-	-	-	-	1	3	-
ECE-401N.3	3	3	3	2	3	-	-	-	-	-	-	2	3	2
ECE-401N.4	3	3	3	2	3	-	-	-	-	-	-	2	3	2
ECE-401N.5	3	3	3	-	2	-	-	2	-	-	-	2	3	2
ECE-401N.6	-	3	3	3	3	2	-	2	2	2	3	2	3	3
AVG	**3**	**3**	**3**	**2.33**	**2.75**	**2**	**-**	**2**	**2**	**2**	**3**	**1.67**	**3**	**2.25**

ECE-403N	DIGITAL IMAGE PROCESSING					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
4	**0**	**0**	**75**	**25**	**100**	**3 Hr.**

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

Digital Image Processing (ECE-403N)													
	COs												
ECE-403N.1	Understand the sampling and quantization processes of digital image												
ECE-403N.2	Apply various image enhancement operations on a digital image												
ECE-403N.3	Analyze the image enhancement techniques in spatial and frequency domain												
ECE-403N.4	Explain the edge detection and segmentation techniques and apply it on medical images												
ECE-403N.5	Create an algorithm for feature extraction and implement in MATLAB												
				CO-PO and CO-PSO mapping									
	Digital Image Processing (ECE-403N)												
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**P09**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
ECE-403.N1	3	2	1	-	-	-	-	-	-	-	-	-	2	-
ECE-403N.2	3	2	1	-	2	3	-	-	2	-	-	-	1	-
ECE-403N.3	3	3	1	-	-	-	-	1	-	1	-	-	2	-
ECE-403N.4	3	1	1	-	-	2	-	-	-	-	-	-	-	2
ECE-403N.5	1	2	3	1	-	-	-	2	2	-	3	1	-	1
AVG	**2.60**	**2.00**	**1.4**	**1.00**	**2.00**	**2.50**	**-**	**1.50**	**2.00**	**1.00**	**3.00**	**1.00**	**1.67**	**1.50**

ECE-405N	POWER ELECTRONICS					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
3	**0**	**0**	**75**	**25**	**100**	**3 Hr.**

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.

POWER ELECTRONICS (ECE-405N)													
	COs												
ECE-405N.1	Outline the basic concepts and techniques used in Power Electronics.												
ECE-405N.2	Explain the characteristics of Thyristor and compare various Thyristor Commutation Techniques.												
ECE-405N.3	Classify various single phase and three phase power converter circuits .												
ECE-405N .4	Analyze the performance of various power electronic circuits.												
ECE-405N.5	Design Converter Circuits and learn to select suitable power electronics device by assessing the requirements of application field.												
				CO-PO and CO-PSO mapping									
	POWER ELECTRONICS (ECE-405N)												
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**P0 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
ECE-405N.1	3	1	1	1	-	-	-	-	-	-	-	-	1	-
ECE-405N.2	3	3	1	2	-	-	-	-	-	1	-	-	1	2
ECE-405N.3	3	2	2	1	-	-	-	-	-	-	-	1	2	2
ECE-405N .4	3	1	1	1	-	-	-	-	-	1	-	1	2	1
ECE-405N.5	2	3	3	1	-	-	--	-	-	1	-	1	2	2
AVG	**2.80**	**2.00**	**1.6**	**1.2**	**-**	**-**	**-**	**-**	**-**	**1.00**	**-**	**1.00**	**1.60**	**1.75**

ECE - 419N	OPTICAL COMMUNICATION					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
3	**0**	**0**	**75**	**25**	**100**	**3 Hr.**

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

Optical Communication (ECE-419N)													
	COs												
ECE-419N.1	Explain the structure of fiber with various modes of propagation and illustrate the concept of light travelling in the fiber.												
ECE-419N.2	Classify the various splices and connectors and analyze its effect while joining the fibers.												
ECE-419N.3	Analyze the concept of various losses associated with fibers and the methods by which the losses can be reduced.												
ECE-419N.4	Understand the concept of optical sources with its characteristics.												
ECE-419N.5	Interpret the working of optical detectors and sensors.												
ECE-419N.6	Illustrate the various components needed in optical networks and explain the different couplers in fiber communication system.												
				CO-PO and CO-PSO mapping									
	Optical Communication(ECE-419N)												
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**P09**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
ECE-419N.1	3	1	1	3	-	-	-	-	-	-	-	-	-	-
ECE-419N.2	3	3	2	-	-	-	-	3	2	3	-	3	2	3
ECE-419N.3	3	3	1	3	-	-	-	3	-	3	-	3	2	3
ECE-419N.4	3	1	1	3	-	-	-	-	3	-	-	-	-	1
ECE-419N.5	3	1	1	-	-	-	-	-	-	-	-	-	-	-
ECE-419N.6	3	1	1	-	-	-	-	-	-	-	-	-	-	-
AVG	**3.00**	**1.67**	**1.16**	**3.00**	-	-	-	**3.00**	**2.50**	**3.00**	-	**3.00**	**2.00**	**2.33**

ECE-423N	SATELLITE COMMUNICATION					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
3	**0**	**0**	**75**	**25**	**100**	**3 Hr.**

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

Satellite Communication (ECE-423N)													
	COs												
ECE-423N.1	Summarize the dynamics of satellite and its services.												
ECE-423N.2	Outline the concept of communication satellite designing system.												
ECE-423N.3	Understand the various basic laws and terms of satellite communication.												
ECE-423N.4	Illustrate the design of earth station and tracking of the satellites.												
ECE-423N.5	Demonstrate the concept and design issues of satellite link design and satellite access.												
ECE-423N.6	Explain the concept of multiple access schemes used in satellite communication.												
				CO-PO and CO-PSO mapping									
	SATELLITE COMMUNICATION (ECE-423N)												
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**P0 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
ECE-423N.1	1	1	1	-	-	-	-	-	-	2	-	-	-	-
ECE-423N.2	3	2	1	2	-	-	-	-	-	-	-	-	1	2
ECE-423N.3	3	1	1	-	-	-	-	-	-	-	-	-	-	2
ECE-423N.4	3	3	3	3	1	-	-	-	-	-	-	-	2	2
ECE-423N.5	3	3	3	2	-	-	-	-	-	-	-	-	1	2
ECE-423N.6	3	1	1	-	-	-	-	-	-	-	-	-	-	2
AVG	**2.67**	**1.83**	**1.67**	**2.33**	**1.00**	**-**	**-**	**-**	**-**	**2.00**	**-**	**-**	**1.33**	**2.00**

8th Semester

ECE-402N	WIRELESS & MOBILE COMMUNICATION					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
4	0	**0**	**75**	**25**	**100**	**3**

Unit–I

Introduction to Wireless Communication Systems: Evolution of mobile radio communications, examples of wireless comm. systems, paging systems, Cordless telephone systems, comparison of various wireless systems.

Modern Wireless Communication Systems: Second generation cellular networks, third generation wireless networks, wireless in local loop, wireless local area networks, Blue tooth and Personal Area networks.

Unit–II

Introduction to Cellular Mobile Systems: Spectrum Allocation, basic Cellular Systems, performance Criteria, Operation of cellular systems, analog cellular systems, digital Cellular Systems.

Cellular System Design Fundamentals: Frequency Reuse, channel assignment strategies, handoff Strategies, Interference and system capacity, tracking and grade off service, improving coverage and capacity.

Unit– III

Multiple Access Techniques for Wireless Communication: Introduction to Multiple Access, FDMA, TDMA, Spread Spectrum multiple Access, space division multiple access, packet ratio, capacity of a cellular systems.

Unit–IV

Wireless Standards-GSM, IS-95, UMTS-IMT-2000, Signaling, Call Control, Mobility Management and location Tracing.

Suggested Books:

1. Theodore S.Reppaport, Wireless Communications Principles and Practice, IEEE Press, Prentice Hall.
2. William C.Y.Lec, Mobile Cellular Telecommunications, Analog and Digital Systems, Mc-Graw Hill Inc.
3. Kamilo Feher, Wireless Digital Communications, Modernization & Spread Spectrum Applications, Prentice Hall of India, New Delhi.
4. Kaveh Pahlavan and Allen H. Levesque “Wireless Information Networks”, Wiley Series, John Wiley and Sons Inc.

Wireless and Mobile Communication (ECE-402N)													
	COs												
ECE-402N.1	Understand mobile radio communication principles and to study the recent trends adopted in cellular systems and wireless standards.												
ECE-402N.2	Examine the measures to increase the capacity in cellular systems - sectorization and Spatial Filtering for Interference Reduction												
ECE-402N.3	Apply basic mathematical principles to solve wireless system design problems for improving coverage and capacity.												
ECE-402N.4	Classify and compare different multiple access techniques used in wireless communication.												
ECE-402N.5	Outline various wireless standards and study the architecture and channel types												
ECE-402N.6	Analyze the mobility of users and manage it through location tracing												
				CO-PO and CO-PSO mapping									
	Wireless and Mobile Communication (ECE-402N)												
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**P09**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
ECE-402N.1	3	2	1	2	-	-	-	-	-	2	2	3	3	3
ECE-402N.2	3	2	2	2	1	1	-	1	-	-	2	-	3	3
ECE-402N.3	3	3	3	2	1	1	-	1	-	-	2	-	3	3
ECE-402N.4	3	1	2	2	-	-	-	-	-	2	1	-	3	3
ECE-402N.5	3	1	2	2	-	-	-	-	-	-	1	-	3	3
ECE-402N.6	3	3	2	2	-	-	-	-	-	-	1	-	3	3
AVG	**3.00**	**2.00**	**2.00**	**2.00**	**1.00**	**1.00**	**-**	**1.00**	**-**	**2.00**	**1.50**	**3.00**	**3.00**	**3.00**

ECE-404N	MICROWAVE ENGINEERING					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
3	**0**	**0**	**75**	**25**	**100**	**3 Hrs**

Unit-I

Microwave Resonators: Brief description of waveguides, coplanar waveguides, cavity resonators: rectangular, cylindrical, spherical and coaxial, excitation and coupling of cavities, Q factor. Microwave Measurements: Measurement of Frequency, Impedance (using slotted section) attenuation, power, dielectric constant, measurement of V.S. W. R., insertion loss and permeability

Unit-II

Microwave Generators: Construction, characteristics, operating principle and typical applications of Klystron(two cavity, multicavity), Reflex Klystron, magnetron(Cylindrical magnetron and description of Π mode applications) and Traveling Wave Tube (TWT).

Unit-III

Matrix Description of Microwave Circuits: Scattering Matrix: properties, measurement of scattering coefficients, scattering matrices for common microwave systems. Microwave Components: Waveguide tees- E-plane, H-plane, magic tee, rat race, directional coupler, tuning screws and stubs, isolators and circulators-their constructional features and applications. Microwave filters, Phase shifters, attenuators, and frequency meter.

Unit-IV

Solid State Microwave Devices: Transferred Electron Devices- Gunn Effect; negative differential resistance phenomenon, field domain formation, Gunn diode structure. Avalanche transit time devices: IMPATT, TRAPATT, BARITT diodes, Parametric amplifiers

Text Book:

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

Reference Books:

1. Annapurna & Sisir K. Das, Microwave Engineering, Tata McGraw-Hill.
2. David M. Pozar, Microwave Engineering, John Wiley and Sons Inc.

MICROWAVE ENGINEERING (ECE-404N)														
	COs													
ECE-404N.1	Apply Maxwell equation to calculate field of the basic resonator cavities.													
ECE-404N.2	Understand the various measurement techniques for microwave parameters such as impedance, frequency and VSWR.													
ECE-404N.3	Analyze the conventional methods to generate the microwave signal.													
ECE-404N.4	Examine the Microwave components using scattering parameters.													
ECE-404N.5	Illustrate the fundamentals of the solid state microwave devices.													
ECE-404N.6	Classify various types of avalanche transit time devices.													
				CO-PO and CO-PSO mapping										
	MICROWAVE ENGINEERING (ECE-404N)													
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**P09**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
ECE-404N.1	3	2	1	-	-	-	-	-	-	-	-	1	3	1
ECE-404N.2	3	2	1	-	2	-	-	-	-	-	-	1	2	2
ECE-404N.3	2	3	2	2	1	-	-	-	-	-	-	2	2	2
ECE-404N.4	2	3	1	1	2	-	-	-	-	-	-	2	3	1
ECE-404N.5	3	1	1	1	-	-	-	-	-	-	-	1	2	2
ECE-404N.6	3	1	1	-	-	-	-	-	-	-	-	1	2	1
AVG	**2.67**	**2.00**	**1.16**	**1.33**	**1.67**	-	-	-	-	-	-	**1.33**	**2.33**	**1.5**

ECE-420N	TRANSDUCERS & ITS APPLICATIONS					
Lecture	**Tutorial**	**Practical**	**Theory**	**Sessionals**	**Total**	**Time**
3		**-**	**75**	**25**	**100**	**3**

Unit-I

Definition of transducer. Advantages of an electrical signal as out-put. Basic requirements of transducers, Primary and Secondary Transducer, Analog or digital types of transducers. Resistive, inductive, capacitive, piezoelectric, photoelectric and Hall Effect tranducers.

Unit-II

Measurement of Pressure – Manometers, Force summing devices and electrical transducers **Measurement of Temperature** – Metallic resistance thermometers, semi conductor resistance sensors (Thermistors), thermo-electric sensors, pyrometers.

Unit-III

Measurement of Displacement – Potentiometric resistance type transducers, inductive type transducers, differential transformer (L.V.D.T), capacitive transducers, Hall effect devices, strain gage transducers.
Measurement of Velocity – variable reluctance pick up, electromagnetic tachometers, photoelectric tachometer, toothed rotor tachometer generator..

Unit-IV

Measurement of Force – Strain-gage load cells, pneumatic load cell, LVDT type force transducer.
Measurement of Torque – Torque meter, torsion meter, absorption dynamometers, inductive torque transducer, digital methods.

Suggested Books:

1. B.C. Nakra, K.K. Chaudhry, "Instrumentation Measurement and Analysis," Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. Thomas G. Beckwith etc. all, "Mechanical Measurements (International Student Edition), Addison-Wesley Longman, Inc. England.
3. A.K. Sawhney, " A Course in Electrical and Electronic Measurements and Instrumentation," Dhanpat Rai & Sons, Delhi-6.

Transducer & its applications (ECE-420N)														
	COs													
ECE-420N.1	Understand the basic concepts and requirements of transducers													
ECE-420N.2	Illustrate different types of transducers for measurement of displacement & pressure													
ECE-420N.3	Examine various types of tachometers for measurement of velocity													
ECE-420N.4	Analyze transducers for measurement of temperature													
ECE-420N.5	Compare the sensitivity of load cells for measurement of force													
				CO-PO and CO-PSO mapping										
	Transducer & its applications (ECE-420N)													
CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**P09**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
ECE-420N.1	3	1	1	-	-	-	-	-	-	-	-	-	-	-
ECE-420N.2	3	2	1	1	-	-	-	-	-	-	-	-	1	-
ECE-420N.3	3	2	1	1	-	-	-	-	-	-	-	-	1	1
ECE-420N.4	3	2	2	1	-	1	-	-	-	-	1	1	2	2
ECE-420N.5	2	1	1	3	-	1	-	-	-	-	-	1	1	1
AVG	**2.80**	**1.60**	**1.20**	**1.50**	**-**	**1.00**	**-**	**-**	**-**	**-**	**1.00**	**1.00**	**1.25**	**1.33**

ECE 422N	RADAR ENGINEERING						
Lecture	**Tutorial**	**Practical**	**Credit**	**Theory**	**Sessionals**	**Total**	**Time**
3	**0**	**0**	**3**	**75**	**25**	**100**	**3 Hr.**

Unit-I

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

Radar Equation: Simple form of Radar Equation, Detection of signals in noise,Signal to Noise ratio, Transmitter Power. Pulse repetition frequenc)' & range ambiguities, System losses, Propagation effects.

Unit-II

CW & Frequency Modulated Radar: The Doppler effect, CW Radar, FM- CW Radar, Multiple Frequency CW Radar.

MTI & Pulse Doppler Radar: Introduction, Delay Line Cancellors. Multiple or staggered Pulse repetition frequencies.range-Gated Doppler Filters, Limitation of MTI performance, Noncoherent MTI, Pulse Doppler radar, MTI from a moving platform.

Unit-III

Tracking Radar: Tracking with Radar, Sequential Lobbing, Conical Scan, Monopulse Tracking Radar, Tracking in range, Acquisition, Low angle tracking.

Unit-IV

Receivers, Displays & Duplexers:
Radar Receivers, Noise Figure, MixerLow-noise Front ends. Displays, Duplexer, Receiver protectors.

Text Book:
I. Introduction to Radar Systems: Merrill!. Skolnik,; MGH
Reference Book:
Electronic Communication Systems: Kennedy; TMH.

Radar Engineering (ECE-422N)	
ECE-422N.1	Understand the components and basic principle of RADAR System.
ECE-422N.2	Evaluate the factors affecting the radar performance using RADAR equation.
ECE-422N.3	Categorize the different RADARs on the basis of working principle, range of observation and angular resolution.
ECE-422N.4	Analyze Noise Figure and Noise Temperature to improve the design of Radar Receivers
ECE - 422N.5	Compare different types of Radar Displays and their application in real time scenario.

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**P09**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
ECE-422 N.1	3	2	-	-	-	-	-	-	-	-	-	-	-	-
ECE-422 N.2	3	2	1	3	-	-	-	-	-	-	-	-	1	-
ECE-422 N.3	3	1	-	2	-	-	-	-	-	-	-	-	1	2
ECE-422 N.4	1	3	2	2	-	-	-	-	-	-	-	-	2	-
ECE-422 N.5	3	2	2	-	-	-	-	-	-	-	-	-	-	2
AVG	**2.60**	**2.00**	**1.67**	**2.33**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1.30**	**2.00**