II/IV B.TECH ECE (FOUR YEAR COURSE) &
II/VI B.TECH ECE (SIX YEAR DOUBLE DEGREE COURSE)
(With effect from 2019-2020 admitted batches onwards)

B.TECH. (ECE) 2ND YEAR I-SEMESTER SCHEME OF INSTRUCTION AND EXAMINATION								
CODE NUMBER	COURSE	HOURS PER WEEK			MAXIMUM MARKS			CREDITS
		THEORY	TUTORIAL	LAB	EXAM	SESSIONALS	TOTAL	
ECE 2101	Mathematics IV	3	0	0	70	30	100	3
ECE 2102	Network Theory Analysis	3	0	0	70	30	100	3
ECE 2103	Electrical Machines	3	0	0	70	30	100	3
ECE 2104	Electronic Devices and Circuits	3	0	0	70	30	100	3
ECE 2105	Switching Theory and Logic Design	3	0	0	70	30	100	3
ECE 2106	Data Structures	3	0	0	70	30	100	3
ECE 2107	Network and Machines Lab	0	0	3	50	50	100	1.5
ECE 2108	Electronic Devices & Circuits Lab	0	0	3	50	50	100	1.5
	Total	**18**	**0**	**6**	**520**	**280**	**800**	**21**

B.TECH. (ECE) 2ND YEAR II-SEMESTER SCHEME OF INSTRUCTION AND EXAMINATION								
CODE NUMBER	COURSE	HOURS PER WEEK			MAXIMUM MARKS			CREDITS
		THEORY	TUTORIAL	LAB	EXAM	SESSIONALS	TOTAL	
ECE 2201	Mathematics V	3	0	0	70	30	100	3
ECE 2202	Electromagnetic Field Theory & Transmission Lines	3	0	0	70	30	100	3
ECE 2203	Analog Electronics Circuits	3	0	0	70	30	100	3
ECE 2204	Probability Theory & Random Process	3	0	0	70	30	100	3
ECE 2205	Signals & Systems	3	0	0	70	30	100	3
ECE 2206	Environmental Studies	2	0	0	70	30	100	0
ECE 2207	Digital ICs and HDL Lab	0	0	3	50	50	100	1.5
ECE 2208	Analog Electronics& Circuits Lab with Simulation	0	0	3	50	50	100	1.5
	Total	**17**	**0**	**6**	**520**	**280**	**800**	**18**

III/IV B.TECH ECE (FOUR YEAR COURSE) &

III/VI B.TECH ECE (SIX YEAR DOUBLE DEGREE COURSE)
(With effect from 2019-2020 admitted batches onwards)

B.TECH. (ECE) 3RD YEAR I-SEMESTER SCHEME OF INSTRUCTION AND EXAMINATION								
CODE NUMBER	COURSE	HOURS PER WEEK			MAXIMUM MARKS			CREDITS
		THEORY	TUTORIAL	LAB	EXAM	SESSIONALS	TOTAL	
ECE 3101	Linear ICs & Applications	3	0	0	70	30	100	3
ECE 3102	Analog Communications	3	0	0	70	30	100	3
ECE 3103	Core Elective I	3	0	0	70	30	100	3
ECE 3104	Antenna & Wave Propagation	3	0	0	70	30	100	3
ECE 3105	Pulse and Digital Circuits	3	0	0	70	30	100	3
ECE 3106	Digital Signal Processing	3	0	0	70	30	100	3
ECE 3107	Soft Skills	2	0	0	-	100	100	0
ECE 3108	Linear ICs and Pulse Circuits Lab	0	0	3	50	50	100	1.5
ECE 3109	Analog Communications Lab	0	0	3	50	50	100	1.5
	Total	**20**	**0**	**6**	**520**	**380**	**900**	**21**

B.TECH. (ECE) 3RD YEAR II-SEMESTER SCHEME OF INSTRUCTION AND EXAMINATION								
CODE NUMBER	COURSE	HOURS PER WEEK			MAXIMUM MARKS			CREDITS
		THEORY	TUTORIAL	LAB	EXAM	SESSIONALS	TOTAL	
ECE 3201	Computer Network Engineering	3	0	0	70	30	100	3
ECE 3202	Microprocessors & Microcontrollers	3	0	0	70	30	100	3
ECE 3203	Digital Communications	3	0	0	70	30	100	3
ECE 3204	Core Elective II	3	0	0	70	30	100	3
ECE 3205	Digital Image Processing	3	0	0	70	30	100	3
ECE 3206	Control Systems	3	0	0	70	30	100	3
ECE 3207	Cellular Mobile Communication	3	0	0	70	30	100	3
ECE 3208	DSP Lab	0	0	3	50	50	100	1.5
ECE 3209	Microprocessors & Microcontrollers Lab	0	0	3	50	50	100	1.5
	Total	**21**	**0**	**6**	**590**	**310**	**900**	**24**

IV/IV B.TECH ECE (FOUR YEAR COURSE) &
IV/VI B.TECH ECE (SIX YEAR DOUBLE DEGREE COURSE)
(With effect from 2019-2020 admitted batches onwards)

B.TECH. (ECE) 4th YEAR I-SEMESTER SCHEME OF INSTRUCTION AND EXAMINATION								
CODE NUMBER	COURSE	HOURS PER WEEK			MAXIMUM MARKS			CREDITS
		THEORY	TUTORIAL	LAB	EXAM	SESSIONALS	TOTAL	
ECE 4101	Principles of Economics & Management	3	0	0	70	30	100	3
ECE 4102	Information Theory & Coding	3	0	0	70	30	100	3
ECE 4103	VLSI Design	3	0	0	70	30	100	3
ECE 4104	Microwave Engineering	3	0	0	70	30	100	3
ECE 4105	Radar Engineering	3	0	0	70	30	100	3
ECE 4106	Core Elective III	3	0	0	70	30	100	3
ECE 4107	Core Elective IV	3	0	0	70	30	100	3
ECE 4108	Digital Communications Lab	0	0	3	50	50	100	1.5
ECE 4109	Microwave Engineering Lab	0	0	3	50	50	100	1.5
	Total	**21**	**0**	**6**	**590**	**310**	**900**	**24**

B.TECH. (ECE) 4th YEAR II-SEMESTER SCHEME OF INSTRUCTION AND EXAMINATION								
CODE NUMBER	COURSE	HOURS PER WEEK			MAXIMUM MARKS			CREDITS
		THEORY	TUTORIAL	LAB	Viva	SESSIONALS	TOTAL	
ECE 4201	Project	0	0	28	50	50	100	14
	Total	**0**	**0**	**28**	**50**	**50**	**100**	**14**

Core Elective –I
1. Computer Architecture & Organization
2. Networks & Protocols
3. Internet & Web Technology
4. Software Engineering
5. OOPS

Core Elective-II
1. Wireless Sensor Networks
2. Micro Electronics
3. EMI/EMC
4. DSP Processors & Architectures
5. Electronic Measurements and Instrumentation

Core Elective –III
1. Fiber Optic Communications
2. Data Communications
3. Bio Medical Signal Processing
4. Embedded Systems
5. TV and Satellite Communication

Core Elective-IV
1. Global Positioning System
2. Tele Communication Switching Systems
3. Smart Antenna Systems
4. Radar Signal Processing
5. Artificial Neural Networks

ECE: 2101 MATHEMATICS-IV

Credits	Periods			Exam Hrs	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	0	0	3	30	70	100

UNIT I :VECTOR CALCULUS-1

Differentiation of vectors, curves in space, velocity and acceleration, relative velocity and relative acceleration, scalar and vector point functions, vector operator □ applied to scalar point functions- gradient, □ applied to vector point functions- divergence and curl. Physical interpretation of □*f* ,□□.*F*,□□□x *F*,□□ applied twice to point functions, □ applied to products of two functions; Irrotational and Solenoidal fields.

UNIT II: VECTOR CALCULUS-2

Integration of vectors, line integral, circulation, work done, surface integral-flux, Green's theorem in the plane, Stoke's theorem, volume integral, Gauss Divergence theorem. Introduction of orthogonal curvilinear coordinates, cylindrical and spherical polar coordinates

UNIT III : INTRODUCTION OF PARTIAL DIFFERENTIAL EQUATIONS

Formation of partial differential equations, solutions of partial differential equarions- equations solvable bydirect integration, linear equations of first order: Lagrange's Linear equarion, non-linear equarions of first order, Charpit's method. Homogeneous linear equations with constant coefficients- rules for finding the complementary function, rules for finding the particular integral (working procedure), non- homogeneous linear equations.

UNIT IV: APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

Method of separation of variables, One dimensional wave equation-vibrations of a stretched string, one dimensional Heat equation, Two dimensional heat flow in steady state - solution of Laplace's equation in Cartesian and polar coordinates(two dimensional).

UNIT V: INTEGRRAL TRANSFORMS

Introduction, definition, Fourier integral, Sine and cosine transforms, Complex form of Fourier integral, Fourier transform, Fourier Sine and Cosine transforms, Finite Fourier Sine and Cosine transforms, properties of Fourier transforms, Convolution theorem for Fourier transforms, Parseval's identity for Fourier transforms, Fourier transforms of the derivatives of a function, simple applications to Boundary value problems.

TEXT BOOKS:

1. Scope and treatment as in "Higher Engineering Mathematics", by Dr.B.S.Grewal, *rd* 43 Edition, Khanna Publishers.

REFERNCE BOOKS:

1. A text book of Engineering Mathematics by N.P. Bali and Dr. Manish Goyal, Lakshmi Publications.
2. Mathematical Methods of Science & Engineering aided with MATLAB by KantiB.Dutta, Cengage Learning India Pvt. Ltd.
3. Advanced Engineering Mathematics by Erwin Kreyszig.
4. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw Hill Company.
5. Advanced Engineering Mathematics by H.K. Dass, S.Chand Company.
6. Higher Engineering Mathematics by Dr. M.K. Venkataraman.

ECE: 2102 NETWORK THEORY ANALYSIS

Credits	Periods			Exam Hrs	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	0	0	3	30	70	100

UNIT I . Analysis of DC Circuits:
Active elements, Passive elements, Reference directions for current and voltage, Kirchoffs Laws, Voltage and Current Division Nodal Analysis, Mesh analysis, Linearity and superposition, Thevinin's theorem and Norton's theorem, Reciprocity theorem, Z,Y,H,S-parameters.

UNIT II . DC transients:
Inductor, Capacitor, source free RL, RC and RLC response, Evaluation of Initial conditions, Application of unit-step function to RL, RC and RLC circuits, concepts of Natural, Forced and Complete response.

UNIT III . SINUSOIDAL STEADY STATE ANALYSIS:
The sinusoidal forcing function, Phasor Concept, Average and Effective value of Voltage and Current, instantaneous and Average Power, Complex Power, Steady State Analysis using mesh and node analysis, application of network theorems to AC circuits, resonance, Concept of Duality.

UNIT IV . NETWORK FUNCTIONS:
Network functions for single port and two port, Calculation of Network functions for Ladder and General Networks, Poles and Zeroes, Restriction of Poles and Zeroes for Driving point and Transfer functions, Time Domain Behavior from Pole Zero plot, Transfer Functions in terms of Y and Z functions, Scaling Network Functions.

UNIT V . POSITIVE REAL FUNCTIONS:
Positive real function and other properties, Herwitz polynomials, Computation of residues, even and Odd functions, Test for Positive Real Functions.

Textbooks:
1. Engineering Circuit Analysis, William H.Hayt Jr. and Jack E. Kemmerley, 5thEdition, McGraw Hill International Edition.
2. Network Analysis, M. E. Van Valkenburg, 3rd Edition, PHI.
3. Modern Network Synthesis, M. E. Van Valkenburg, Wiley Eastern.

ECE: 2103 ELECTRICAL MACHINES

Credits	Periods			Exam Hrs	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	0	0	3	30	70	100

UNIT I DC MACHINES

Constructional Features, Function of Commutator, Induced EMF and Torque Expressions, Relationship Between Terminal Voltage and Induced EMF for Generator and Motoring Action, Different Types of Excitation and Performance Characteristics of Different Types of DC Machines, Starting and Speed Control of DC Motors, Losses and Efficiency, Efficiency by Direct Loading, Swinburne's Test and Hopkin's Test, Applications of DC Machines.

UNIT II TRANSFORMERS

Constructional Details, EMF Equation, Equivalent Circuit, Voltage Regulation, Losses and Efficiency, Auto – Transformers, Instrument Transformers, Open/Short – Circuit Tests and Determination of Efficiency and Regulation.

UNIT III THREE – PHASE INDUCTION MACHINES

Construction, Rotating Magnetic Field and 3ph Induction Motor, Power Flow Diagram, Torque and Torque-slip Characteristics, Condition for Max. Torque and its Value, Starting and Speed Control, Losses and Efficiency, Equivalent Circuit and Circle Diagram of Induction Motor, No – Load and Rotor – Blocked Tests and Efficiency and Torque – Speed Characteristics.

UNIT IV THREE – PHASE SYNCHRONOUS MACHINES

Generation of EMF, Constructional Details, Induced EMF, Synchronous Generator on No –Load and Load, Synchronous Impedance and Voltage Regulation.

UNIT V

V – Curves and Inverted V – Curves, Synchronous Condenser, Starting of Synchronous Motors, Applications of Synchronous Machines.

UNIT VI SINGLE – PHASE MOTORS

Double Revolving Field Theory, Methods of Starting Single Phase Induction Motors, Universal Motor, Stepper Motor.

Text Books:

1. Electrical Machines, S. K. Bhattacharya, TMH Publications N. Delhi.
2. A First Course In Electrical Engineering, S. M. Tiwari, A. S. Binsaroor, Wheeler Publications.

ECE: 2104 ELECTRONIC DEVICES AND CIRCUITS

Credits	Periods			Exam Hrs	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	0	0	3	30	70	100

UNIT I Energy Band Theory of Solids
Intrinsic and Extrinsic Semiconductors Doping, Doping Materials, Carrier Mobility, Conductivity, Diffusion and continuity equation, Hall – Effect and its Application.

UNIT II Semiconductor Diodes
Band structure of PN Junction, Quantitative Theory of PN Diode, Volt – Amp. Characteristics, Temperature Dependence, Transition and Diffusion Capacitance of PN Junction, Zener and Avalanche Breakdowns, Tunnel Diode, LED, Schottky Barrier Diode, Varactor Diode, Photo Diode, PIN Diode, Point Contact Diode.

UNIT III Diode Rectifiers
Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Ripple Factor and Regulation Characteristics.

UNIT IV Bipolar Junction Transistor
NPN and PNP junction Transistor, Characteristics of Current Flow across the Base Regions, Minority and Majority Carrier Profiles, CB, CE and CC Configurations and their Input and Output Characteristics. Comparison of CE, CB and CC Configurations. Junction Biasing for Saturation, Cutoff and Active Region, α and β Parameters and the relation between them, Photo Transistor, various Biasing circuits, stabilizations, thermal runaway, thermal stability, Transistor series and shunt voltage regulators.

UNIT V 5 JFET
JFET and its characteristics, Pinch off Voltage, Drain Saturation Current, JFET biasing, MOSFET –Enhancement and Depletion Modes, Small signal models of FET.

UNIT VI Small Signal – Low Frequency Transistor Amplifier Circuits
Transistor as an Amplifier, h – parameter model, Analysis of Transistor Amplifier Circuits using h –parameters. CB, CE and CC Amplifier configurations and performance factors. Analysis of Single Stage Amplifier, RC Coupled Amplifiers. Effects of Bypass and Coupling Capacitors. Frequency Response of CE Amplifier, Emitter – Follower, Cascaded Amplifier.

Text Books:
1. Integrated Electronics, Analog Digital Circuits and systems, Jacob Millman and D. Halkias, McGraw Hill.
2. Electronic Devices and Circuits, G.S.N. Raju, I.K. International Publications, New Delhi, 2006.
References:
1. Electronic Devices and Circuits 2nd Edition, B. V. Rao and K. Raja Rajeswari, Pearson Education
2. Electronic Devices and Circuits, K. VenkatRao, K. Rama Sudha, McGraw Hill education, Edition-2015.
3. Electronic Devices and Circuits Theory, Boylsted and Nashelsky, Prentice Hall Publications.

ECE: 2105 SWITCHING THEORY AND LOGIC DESIGN

Credits	Periods			Exam Hrs	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	0	0	3	30	70	100

Unit-1 Number system and codes:
Number systems, Base conversion methods, Complement of numbers, Codes: Binary, Non binary, Decimal, Alphanumeric, Gray, Error detecting and error correcting codes. Logic Gates: AND, OR, NOT, NAND, NOR, XOR, EX-NOR and Universal Gates

Unit-2 Minimization of Boolean Functions:
Fundamental postulates of Boolean algebra, Basic theorems, Simplification of Boolean equations, Min terms, Max terms, Standard form of Boolean functions. Simplification of functions: Karnaugh map method and Quine-McClusky methods (up to six variables), Multiple Output functions, incomplete specified functions.

Unit-3 Combinational Logic-Circuit Design-1:
Logic design of combinational circuits: Adders and Subtractors: Binary, BCD, Excess -3 and Look –ahead-carry adder, Code converters, Multiplexers, De multiplexers, Encoders, Decoders and priority encoders, Realization of Boolean functions using multiplexers, De multiplexers and Decoders

Unit-4 Combinational Logic-Circuit Design-I1
Design of 4-bit comparator, Parity checker/Generator, Seven segment decoders, Hazards in combinational circuits, Hazard free realizations. Basics of PLDs: Basic structure of PROM, PAL, PLA, CPLD, FPGAs, Realization of Boolean functions with PLDs and their merits and demerits.

Unit-5 Sequential circuits:
Classification of sequential circuits, SR-latch, Gated latches, Flip flops: RS, JK, D, T and Master slave flip flops, Excitation tables, flip flop conversion from one type to another. Design of counters: Ripple counters, Synchronous counters, asynchronous counters, up-down counters, Johnson counter, ring counter. Design of registers: Buffer registers, Shift registers, Bi directional shift registers, Universal shift register

Unit-6
Analysis and design of finite state machines, State assignment, State tables, Equivalent states, Elimination of Redundant states, Determination of state equivalence, Reduction using implication table, reducing incompletely specified state tables.

Text Books:
1. Switching and finite Automatic theory, ZuiKohari, TMH
2. Switching theory and logic design by Frederick.J.Hill and Gerald.R.Peterson
3. Switching theory and logic design, Anandakumar, PHI.

References:
1. Fundamentals of Logic Design, Charles.R.Roth, Thomson Publications.
2. Digital Design by Morries Mono, PHI.

ECE: 2106 DATA STRUCTURES

Credits	Periods			Exam Hrs	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	0	0	3	30	70	100

1. **Revision of C Language Overview only**
(no questions to be set on this).

2. Arrays and Functions:
Organization and use of One Dimensional, Two Dimensional and Multi Dimensional Arrays, Handling of Character Strings, String Operation, Concept of Function, Parameter Passing, Recursion.

3. Structures, Pointers and Files:
Definition of Structure and Union, Programming examples; Pointers, Pointer Expressions, Programming examples; File Operations, Preprocessor.

4. Linear Data Structures:
Stack Representation, Operation, Queue Representation, Operations, Circular Queue, List, Representation, Operations, Double Linked and Circular Lists.

5. Non-Linear Data Structures:
Trees, Binary Tree Representation, Tree Transversals, Conversion of a General Tree to Binary Tree, Representation of Graphs.

6. Searching Techniques:
Basic Search Techniques, Tree Searching Graphics, Linked Representation of Graphics, Graph Transversal and Spanning Trees.

Text Books:
1. Programming In ANSI C, by E. Balaguruswamy.
2. Data Structures Using C, by A. M. Tanenbaum and others.
Reference Books:
1. An Introduction To Data Structures With Applications, Trembly and Sorenson.
2. The C – Programming Language, Kerningham and others.

ECE: 2107 NETWORKS AND MACHINES LAB

Credits	Periods			Exam Hrs	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
1.5	0	0	3	3	50	50	100

LIST OF EXPERIMENTS

I. NETWORK LAB EXPERIMENTS

1. Verification of Superposition Theorem
2. Verification of Reciprocity Theorem
3. Verification of Thevenin's Theorem
4. Calibration of UPF Wattmeter
5. Verification of Ohm's law
6. Verification of Kirchhoff's law

II. ELECTRICAL MACHINES LAB EXPERIMENTS

7. No load and blocked rotor tests on 3-phase squirrel cage Induction motor
8. Regulation of alternator by synchronous Impedance method
9. Open circuit test and short circuit test on 1-phase transformer
10. Swin burner's test
11. No load and load characteristics of self-excited Shunt generator

ECE: 2108 ELECTRONIC DEVICES AND CIRCUITS LAB

Credits	Periods			Exam Hrs	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
1.5	0	0	3	3	50	50	100

LIST OF EXPERIMENTS

1. Study of CRO and Applications
2. V-I Characteristics of PN Junction Diode
3. V-I Characteristics of Zener Diode and Zener regulator characteristics.
4. V-I Characteristics of LED
5. V-I characteristics of Photo diode
6. Half-wave and full-wave rectifiers
7. Half-wave and full-wave rectifiers with capacitor filter
8. CE characteristics of BJT, h-parameters
9. CB characteristics of BJT, h-parameters
10. Voltage gain, input impedance and output impedance of emitter follower
11. Drain and transfer characteristics of JFET
12. Frequency response of CE amplifier

ECE: 2201 MATHEMATICS- V

Credits	Periods			Exam Hrs	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	0	0	3	30	70	100

UNIT I: FUNCTIONS OF A COMLEX VARIABLE- I

Introduction-Limit and continuity of f(z)- Derivative of f(z), Cauchy-Reimann Equations, Harmonic functions, Orthogonal systems, Applications to flow problems, Geometrical representation of f(z), Conformal mappings, some standard transformations: (i) w = z+c, (ii) w = cz, (iii) w =1/z, (iv) Bilinear transformation w=az+b/cz+d.

UNIT II: FUNCTIONS OF A COMLEX VARIABLE- II

Integration of complex functions, Cauchy's theorem, Cauchy's integral formula, Series complex terms –Taylor's and Laurent's series (without proofs).Zero's and Singularities of analytic functions. Residues and calculations of Residues, Cauchy's Residue theorem**,** Evaluation of real definite integrals: Integration around unit circle, semi circle, rectangular contour and contours having poles on the real axes

UNIT III: DIFFERENCE EQUATIONS

Finite difference equations-order and solution of difference equations, formation of difference equations, linear difference equations, rules for finding the complementary function and articular integral.

UNIT IV: Z-TRANSFORMS

Introduction to Z-transforms, standard Z-transforms, linear property, damping rule, some standard results, shifting rules, initial and final value theorems, Convergence of Z-transforms, evaluation of inverse Z-transforms, applications of Z-transforms to solve difference equations.

UNIT V: SAMPLING THEORY

Sampling distribution, standard error, testing of hypothesis, level of significance, confidence limits, sampling of variable-large samples and small samples, students t-distribution, xz-distribution and F-distribution.

TEXT BOOKS:

1. Scope and treatment as in "higher engineering Mathematics", by Dr.B.S.Grewal, **43rdEdition**, Khanna Publishers.

REFERENCE BOOKS:

1. Advanced Engineering Mathematics by Erwin Kreyszig.
2. A text book of Engineering Mathematics by N.P. Bali and Dr. Manish Goyal, Lakshmi Publications.
3. Mathematical Methods of science & Engineering aided with MATLAB by KantiB.Dutta, Cengage Learning India Pvt. Ltd.
4. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw Hill Company.
5. Advanced Engineering Mathematics by H.K.Dass. S.Chand Company.
6. Higher Engineering Mathematics by Dr. M.K. Venkataraman.
7. Engineering Mathematics series by Chandrica Prasad.

ECE: 2202 ELECTROMAGNETIC FIELD THEORY & TRANSMISSION LINES

Credits	Periods			Exam Hrs	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	0	0	3	30	70	100

Unit -1 Electrostatics

Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Maxwell's Two Equations for Electrostatic Fields, Energy ensity, Convection and Conduction Currents, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations; Capacitance.

Unit -2 Magneto statics

Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magneto static Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Inductances and Magnetic Energy.

Unit -3 Maxwell's Equations

Faraday's Law and Transformer emf, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements. Conditions at a Boundary Surface: Dielectric-Dielectric and Dielectric-Conductor Interfaces. Related Problems.

Unit -4 Electromagnetic Waves

Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Polarization, Reflection and Refraction of Plane Waves – Normal and Oblique Incidences for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance. Poynting Vector and Poynting Theorem

Unit -5 Transmission Lines

Introduction to Transmission line equations, Primary & Secondary constants Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Losslessness /Low Loss Characterization, Distortion , Loading, SC and OC Lines, Reflection Coefficient, VSWR, $\lambda/8$, $\lambda/4$, $\lambda/2$ line impedance Transformations, Smith Chart – Configuration and Applications.

Unit -6 Waveguides

Introduction, Rectangular Waveguides, electric and magnetic field patterns in TE10 and TE11 mode configuration, modes of TE wave in rectangular waveguide, field equations, impossibility of TEM wave propagation in waveguides, cutoff frequency of rectangular waveguide, propagation constant, wave impedance, phase velocity, group velocity, dominant mode and degenerate modes, related problems.

Textbooks

1. Electromagnetic Field Theory and Transmission Lines, GottapuSasibhushanaRao, Wiley India Pvt. Ltd. , New Delhi, 1st Ed.,2012.
2. Electromagnetics with Applications, Kraus and Fleisch, McGraw Hill, 1999.
3. Electromagnetic Field Theory and Transmission Lines, G.S.N. Raju, Pearson Education (Pvt., Ltd., New Delhi, 2005.

References:

1. Elements of Electromagnetic – Matthew N.O. Sadiku, Oxford Univ. Press, 3rd ed., 2001.
2. Engineering Electromagnetics, W. H. Hayt Jr., McGraw Hill – New York.
3. EM Waves and Radiating Systems, E. C. Jordan, PHI, 1997.

ECE: 2203 ANALOG ELECTRONICS CIRCUITS

Credits	Periods			Exam Hrs	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	0	0	3	30	70	100

Unit:1 Small Signal High Frequency Transistor Amplifier models:
BJT: Transistor at high frequencies, Hybrid-□ common emitter transistor model, Hybrid-□ conductance's, Hybrid-□□capacitances, validity of Hybrid-□ model, determination of high frequency parameters in terms of low frequency parameters, CE short circuit current gain, current gain with resistive load, cut-off frequencies, frequency response and gain bandwidth product.

FET: Analysis of common source and common drain amplifier circuits at high frequencies.

Unit:2 Multistage Amplifiers
BJT and FET RC Coupled Amplifiers – Frequency Response. Cascaded Amplifiers.
Calculation of Band Width of Single and Multistage Amplifiers. Concept of Gain Bandwidth Product.

Unit:3 Feedback Amplifiers
Concept of Feedback Amplifiers – Effect of Negative feedback on the amplifier Characteristics. Four Feedback Amplifier Topologies. Method of Analysis of Voltage Series, Current Series, Voltage Shunt and Current Shunt feedback Amplifiers.

Unit:4 Sinusoidal Oscillators
Condition for oscillations –LC Oscillators – Hartley, Colpitts, Clapp and Tuned Collector Oscillators – Frequency and amplitude Stability of Oscillators – Crystal Oscillators – RC Oscillators -- RC Phase Shift and Weinbridge Oscillators.

Unit:5 Power Amplifiers
Classification of Power Amplifiers – Class A, Class B and Class AB power Amplifiers. Series Fed, Single Ended Transformer Coupled and Push Pull Class A and Class B Power Amplifiers. Cross-over Distortion in Pure Class B Power Amplifier, Class AB Power Amplifier – Complementary Push Pull Amplifier, Derating Factor – Heat Sinks.
Unit:6 Tuned Voltage Amplifiers
Single Tuned and Stagger Tuned Amplifiers – Analysis – Double Tuned Amplifier – Bandwidth Calculation.

Text Books :
1. Integrated Electronics, Analog Digital Circuits and systems, **Jacob Millman** and **D. Halkias**, McGraw Hill, 1972
2. Electronic Devices and Circuits by **Salivahanan, N.Suresh Kumar** and**A.Vallava Raj** TMH, 2nd Edition, 1998.
3. Electronic Circuit Analysis, **B.V.Rao**, **K.RajaRajeswari et.al**, Pearson Publishers
References:
1. Electronic Devices and Circuits, **G.S.N. Raju**, IK International Publications, New Delhi, 2006.
2. Electronic Devices and Circuits – **G.K.Mithal**, Khanna Publishers, 23rd Edition, 2004.

ECE: 2204 PROBABILITY THEORY & RANDOM PROCESS

Credits	Periods			Exam Hrs	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	0	0	3	30	70	100

Unit-I : Probability Theory

Sample spaces, Events, Probability definition and Axioms, Mathematical model of experiments, Probability as relative frequency, Joint and conditional probability, Properties of joint probability and conditional probability, Total probability, Bayes' theorem, Independent events: Two events and multiple events, properties of independent events.

Unit-II: Random Variables and Operations on one random variable

Random variable concept, Distribution function, Density function, Gaussian random variable, Conditional distribution and density function, Expectation, Moments, Functions that give moment, Transformations of a random variable.

Unit-III: Multiple random variables

Vector random variables, Joint distribution and its properties, Joint density and its properties, Conditional distribution and density, statistical independence, Distribution anddensity of a sum of random variables, Central limit theorem.

Unit-IV: Operations on multiple random variables

Expected values of a function of random variables: Joint moments about the Origin, joint central moments, Joint characteristic functions, Jointly Gaussian random variables: Two random variables, n-random variables, properties of Gaussian random variables, Transformations of multiple random variables: One function, Multiple functions, Inequalities of Chebyshev and Schwartz.

Unit-V : Random Processes

The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence, First-Order Stationary Processes, Second- Order and Wide-Sense Stationarity, (N-Order) and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation Function and Its Properties, Covariance Function and their properties, Weiner-Kinchine Theorem ,Gaussian Random Processes, Poisson Random Process.

Unit-VI: Linear Systems with Random Inputs

System Response – Convolution, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output, Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output, Band pass, Band-Limited and Narrowband Processes.

Textbook:

1. Probability Theory and Random Signal Principles, Peyton Z. Peebles,Jr, 4th edition Tata McGrew Hill Publishers,2002.
2. Probability Theory and Random Processes, S. P. Eugene Xavier, S. Chand and Co. New Delhi, 1998 (2nd Edition).

References:

1. Fundamentals of Applied Probability and Radom processes, Oliver C.Ibe, Elsevier Publications, 2007.
2. Probability, Random Variables and Stochastic Processes – Athanasios Papoulis and S. UnnikrishnaPillai, PHI, 4th Edition, 2002.
3. Probability theory and Stochastic Processes, B.PrabhakaraRao, T.S.R.Murthy, BS Publications, Hyderabad, 2012.

ECE: 2205 SIGNALS & SYSTEMS

Credits	Periods			Exam Hrs	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	0	0	3	30	70	100

Unit 1 Introduction to signals and linear time Invariant systems

Continuous –Time and Discrete –Time signals, Signal Energy and Power, Periodic Signals, Even and odd Signals, continuous- Time complex Exponential and Sinusoidal Signals, Discrete –Time complex Exponential and Sinusoidal Signals, Periodicity Properties of Discrete –Time Complex Exponentials, The Unit Impulse and Unit step Functions, The Discrete- Time Unit Step and Unit Impulse Functions, The Continuous-Time Unit impulse and Unit step Sequence, Continuous – Time and Discrete –Time Systems, Interconnections of Systems, Basic System Properties, Discrete –Time LTI Systems: The Convolution Sum, The Representation of Continuous –Time Signals in terms of Impulses, The Commutative property, Casual LTI Systems Described by Differential and Difference Equations, Singularity Functions.

Unit-2 Fourier Series Representation of Periodic Signals

Introduction, Fourier Series Representation of continuous time Periodic Signals, convergence of the Fourier Series, Properties of continuous time Fourier Series, Fourier Series representation of discrete time periodic signals, Properties of discrete time Fourier Series.

Unit-3 Continuous and Discrete time Fourier Transform

Introduction, Representation of Aperiodic signals, The continuous time Fourier Transform, The FourierTransform for periodic signals, Properties of the continuous time Fourier Transform, The convolution Property,Multiplication property, Systems characterized by linear constant-coefficient differential equations. Discrete time Fourier Transform, Representation of Aperiodic signals discrete time Fourier Transform, FourierTransform for periodic signals, Properties of the Discrete time Fourier Transform, The convolution property,The multiplication property, Duality, Systems characterized by linear constant co-efficient differential equations.

Unit-4 Convolution and correlation of signals

System analysis by Convolution, Convolution as a superposition of impulse response, some Convolution relationships, Graphical interpretation of Convolution, Convolution of a function with a unit impulse, Signal comparison, Correlation and Convolution, Some properties of correlation functions, Correlation functions for nonfinite energy signals, Detection of periodic signals in the presence of Noise by correlation, Determination of the waveform of a periodic signal masked by Noise, Extraction of a signal from Noise by filtering.

Unit-5 Laplace Transform

Introduction, The Laplace Transform, the region of convergence for Laplace Transforms, The Inverse Laplace Transform, Geometrical evaluation of the Fourier transform from the Pole-Zero plot, Properties of Laplace Transforms, The initial and Final value theorems, Analysis and characterization of LTI systems using the Laplace Transforms.

Unit-6 Sampling Theorem and Z-transform

Introduction, reconstruction of a signal from its samples using interpolation, The effect of Undersampling:
aliasing, Discrete time processing of continuous time signals, sampling of Discrete time signals. The ZTransform,

The Inverse Z-Transform, Geometrical evaluation of the Z-Transform from the Pole-Zero plot, Properties of Z-Transform, The initial theorems, some common Z-transform pairs, Analysis and characterization of LTI systems using the Z-Transforms, System function algebra and block diagram representation, The unilateral Z-Transform.

Textbooks:

1.Signals and Systems, Alan V. Oppenheim, Alan S. Willsky and Ian T. Young, PHI, 2ndEdn.
2. Signals Systems and Communication, B. P. Lathi, BS Publication
3. Signals and Systems, K. Raja Rajeswari and B. V. Rao, Prentice Hall of India.

References:

1. Signals and Systems- Simon Haykin and Van Veen, Wiley 2ndEdn.
2. Signals and Systems – P.RameshBabu and R.AnandaNatarajan 3rdEdn.

ECE: 2206 ENVIRONMENTAL STUDIES

	Periods	Exam	Sessional	Exam	Total

Credits	Theory	Tutorial	Lab	Hrs	Marks	Marks	Marks
3	3	0	0	3	30	70	100

Module 1 : Introduction
Definition, Score and importance, Measuring and defining environmental development : Indicators

Module 2 : Ecosystems
Introduction, Types, Characteristic features, Structure and functions of ecosystems, Forest, Grassland, Desert, Aquatic (lakes, rivers and estuaries).

Module 3 : Environment and Natural Resources Management
Land Resources : Land as a resource, Common property resources, land degradation, Solerosion and desertification, Effects of modern agriculture, fertilizer-pesticide problems, Forest Resources : Use and over-exploitation, Mining and dams – their effects on forest and tribal people, Water resources : Use and over-utilization of surface and ground water, Floods, roughts, Water logging and salinity, Dams – benefits and costs, Conflicts over water, Energy Resources : Energy needs, Renewable and non-renewable energy sources, Use of alternate energy resources, Impact of energy use on environment.

Module 4 : Bio-Diversity and its Conservation
Value of bio-diversity – Consumptive and productive use, Social, Ethical, Aesthetic and option values, Bio-geographical classification of India – India as a mega diversity habitat, Threats to biodiversity – Hot-sports, habitat loss, poaching of wildlife, loss of species, seeds etc., Conservation of biodiversity – in – situ and ex-situ conservation.

Module 5 : Environmental Pollution – Local and Global Issues
Causes, Effects and control measures of : Air pollution, Indoor air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Solid waste management, Compositing, Vermiculture, Urban and industrial wastes, Recycling and re-use, Nature of thermal pollution and nuclear hazards, Global warming, Acid rain, Ozone depletion.

Module 6 : Environmental Problems in India
Drinking water, Sanitation and public health, Effect of activities of the quality of environment : Urbanization, ransportation, Industrialization, Green revolution, Water scarcity and ground water depletion, Controversies on major dams –esettlement and rehabilitation of people problems and concerns, Rain water harvesting, Cloud seeding and watershed management.

Module 7 : Economy and Environment
The economy and environment interaction, Economics of development, Preservation and conservation, Sustainability : Theory and practice, Limits to growth, Equitable use of resources for sustainable lifestyles, Environmental impact assessment.

Module 8 : Social Issues and the Environment
Population growth and environment, Environmental education, Environmental movements, Environment Vs development.

Module 9 : Institutions and Governance
Regulation by Government, Monitoring and enforcement of environmental regulation, Environmental acts : Water (Prevention and control of pollution) act, air (Prevention and control

of pollution) act, Environmental Protection Act, Wild life protection act, Forest conservation act, Costal zone regulations, Institutions and policies relating to India, Environmental Governance.

Module 10 : International Conventions
Stockholm Conference 1972, Earth Summit 1992, World Commission for Environmental Development (WCED).

Module 11 : Case Studies
Chipko movement, Narmada bachaoandolan, Silent valley project, Madhura refinery and TajMajal, Industrialization of pattancheru, Nuclear reactor at Nagarjuna Sager, Tehri Dam, Ralegaon Siddhi (Anna Hazare), Kolleru lake – Acquaculture, Florosis in Andhra Pradesh.

Module 12 : Field Work

Visit to a local area to document and mapping environmental assets – River / forest / grassland / hill /mountain, Study of local environment – Common plants, Insects, Birds, Study of simple ecosystems –Pond, river, hill, slopes etc. Visits to industries, Water treatment plants, Affluent treatment plants.

Textbooks : Kaushik – Kaushik, Anubha

Reference : Deswal&Deswal, Raja Gopal, Dharmaraj Publishers.

ECE: 2207 DIGITAL ICS AND HDL LAB

Credits	Periods			Exam Hrs	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
1.5	0	0	3	3	50	50	100

LIST OF EXPERIMENTS

HARDWARE EXPERIMENTS

1. Logic Gates
2. Realization of Gates by using universal building blocks
3. Realization of SOP and POS
4. Verification of Demorgan's Laws
5. Half Adder & Full adder
6. Function generation by using Decoders & Multiplexers.
7. Realization of Flip - flops
8. 4-bit Ripple counter
9. Mod-8 Synchronous counter.
10. 4 - bit Shift-register
11. Seven segment display

SIMULATION EXPERIMENTS

1. Simulation of Logic gates
2. Simulation of Full adder
3. Simulation of Multiplexer & De-Multiplexer
4. Simulation of Decoder & Encoder
5. Simulation of Flip flops (SR & D)
6. Simulation of Up-down counter& Shift register

ECE: 2208 ANALOG ELECTRONICS & CIRCUITS LAB WITH SIMULATION

Credits	Periods			Exam Hrs	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
1.5	0	0	3	3	50	50	100

LIST OF EXPERIMENTS

1. Current series feedback Amplifier
2. Colpitts oscillator
3. RC-Phase shift oscillator
4. Two stage RC-Coupled Amplifier
5. Wein bridge oscillator
6. Hartley Oscillator
7. Class-B Push pull Amplifier
8. Voltage series feedback Amplifier
9. Common source FET Amplifier
10. Tuned Voltage Amplifier
11. Applications of Operational Amplifier
12. Frequency response of Op-amp

(Software Simulation)

13. Common emitter and common source Amplifier
14. Two stage RC coupled Amplifier
15. RC Phase shift oscillator using transistors
16. Class-A Power Amplifier (transformer less)
17. Class-B complementary symmetry Amplifier
18. High frequency common base (BJT) and common gate (JFET) Amplifier

ECE 3101 LINEAR ICS AND APPLICATIONS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
3	3	0	-	3	30	70	100

1. Operational Amplifiers: Design Aspects of Monolithic Op-Amps, Ideal Characteristics, AC and DC Characteristics, Data sheet Specifications, Offset Voltages and Currents, Frequency Compensation Techniques, Measurement of Op-Amp Parameters.
2. Applications of Op-Amps: Inverting and Non-inverting Amplifiers, Integrator, Differentiator, Comparator, Logarithmic Amplifiers, Instrumentation Amplifiers, Op-Amp Phase Shift, Wein-bridge and Qudrature Oscillator, Voltage Controlled Oscillators, Voltage to Current and Current to Voltage Converters., Analog Multiplexers.
3. Signal Conditioning Circuits: Rectifiers, Peak Detection and, Wave form Generators, Sample and Hold Circuits, Multivibrators, Square Wave Generators, Schmittrigger.
4. Active Filters: LPF, HPF, BPF, BEF, All-pass Filters, Higher Order Filters and their Comparison, Switched Capacitance Filters.
5. Special ICs: 555 Timers, 556 Function Generator ICs and their Applications, Three Terminal IC Regulators, IC 1496 (Balanced Modulator), IC 565 PLL and its Applications, Function Generators, Voltage to Frequency and Frequency to Voltage Converters.
6. Digital to Analog and Analog to Digital Converters: DAC techniques, Weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, Different types of ADCs-parallel Comparator type ADC, Counter type ADC, Successive approximation ADC and dual type ADC, DAC and ADC specifications, Integrated ADC and DACs.

Text Books:

1. Op-Amps and Linear ICs- RamakanthGayakwad, PHI, 1987.
2. Linear Integrated Circuits- D.RoyChowdhury, New Age International(p) Ltd,2nd Edition ,2003.

Reference Books:

1. Integrated Circuits- Botkar, Khanna Publications.
2. Applications of Linear ICs- Clayton.
3. Microelectronics-JacobMillman.

ECE 3102 ANALOG COMMUNICATION

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
3	3	0	-	3	30	70	100

1. Linear Modulation Systems:

Need for Modulation, Frequency Translation, Method of Frequency Translation, Amplitude Modulation, Modulation Index, Spectrum of AM Signal, Modulators and Demodulators (Diode detector), DSB-SC Signal and its Spectrum, Balanced Modulator, Synchronous Detectors, SSB Signal, SSB Generation Methods, Power Calculations in AM Systems, Application of AM Systems.

2. Angle Modulation Systems:

Angle Modulation, Phase and Frequency Modulation and their Relationship, Phase and Frequency Deviation, Spectrum of an FM Signal, Bandwidth of Sinusoidally Modulated FM Signal, Effect of the Modulation Index on Bandwidth, Spectrum of Constant Bandwidth FM, Phasor Diagram for FM Signals, FM Generation:Parameter variation method, Indirect method of Frequency Modulation (Armstrong Method), Frequency Multiplication, PLL FM Demodulator, Pre – emphasis and De –emphasis, Comparison of FM and AM.

3. Noise in AM and FM Systems:

Sources of Noise, Resistor Noise, Shot Noise, Calculation of Noise in a Linear System, Frequency Domain representation of Noise, The effect of Filtering on the Probability density of Gaussian Noise, Effect of filter on the power spectral Density of Noise, Narrow Bandwidth, Quadrature components of Noise, Power spectral density of Noise, Probability Density of Noise and their time derivatives, representation of Noise using Orthonormal coordinates, Noise in AM Systems, Noise in Angle Modulation Systems, Comparison between AM and FM with respect to Noise, Threshold Improvement in Discriminators, Comparisons between AM and FM.

4. Radio Transmitters:

Classification of Radio Transmitters, Principle of a Radio Transmitters, AM and FM Transmitters, Radio Telegraph and Radio Telephone Transmitters, SSB Transmitters.

5. Radio Receivers:

Radio receiver Types, AM Receivers – RF Section, Frequency Changing and Tracking, Intermediate Frequency and IF Amplifiers, Automatic Gain Control (AGC); FM Receivers – Amplitude Limiting, FM Demodulators, Ratio Detectors, ISB Receiver, Comparison with AM Receivers, Extensions of the Super-heterodyne Principles, Additional Circuits.

6. Pulse Analog Modulation methods:

Pulse Modulation techniques, Sampling, Types of Sampling and its analysis, Time division Multiplexing, Pulse Amplitude Modulation, Pulse Width Modulation, Pulse position modulation, Pulse Code Modulation.

Text Books:

1. Principles of Communication Systems, H. Taub , D. L. Schilling and GouthamSahe, TMH 3rd edition, 2007.

2. Principle of Communication Systems, Simon Haykins (2nd Edition).
3. Electronic Communication Systems, G. Kennedy, McGraw Hill, 1977 (2nd Edition).

References:

1. Modern Digital and Analog Communication Systems, B. P. Lathi (2nd Edition).
2. Communication systems, R.P.Singh and S.D.Sapre 2nd edition TMH 2008
3. Electronic Communications Modulation and Transmission, Robert J. Schoenbeck, PHI N. Delhi, 1999.

ECE 3103-(1) COMPUTER ARCHITECTURE & ORGANIZATION

(Core Elective-I)

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
3	3	0	-	3	30	70	100

1. Register Transfer and Micro operations:

Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit.

2. Basic Computer Organization:

Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input-Output and Interrupt, Complete Computer Description**.**

3. CPU Organization:

Introduction, General Register Organization, Instruction formats, Addressing modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC), Stack Organization.

4. Micro Programmed Control:

Control memory, Address sequencing, Microinstruction Formats, Microprogram Example, Design of Control Unit.

5. Memory Organization:

Memory Hierarchy, Main memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

6. Input-Output Organization:

Peripheral Devices, Input-output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA).

7. Introduction to Multiprocessor System

Introduction, Interconnection Structures, Interprocessor Arbitration, Interprocess Communication and Synchronization.

Text Book:

1. Computer System Architecture, M.Morris Mano, PHI Publications, 3rd Edition May 1996.

References:

1. Computer Organization, V.CarlHamacher, ZvonkoG.Vranesic and SafwatG.Zaky, McGraw Hill International, 4th Edition.
2. Digital Computer Fundamentals, Thomas C.Bartee.

ECE 3103-(2) NETWORK PROTOCOLS

(Core Elective-I)

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
3	3	0	-	3	30	70	100

FUNDAMENTALS OF NETWORKING STANDARDS AND PROTOCOLS

Network Communication Architecture and Protocols - OSI Network Architecture seven Layers Model - Definition and Overview of TCP/IP Protocols -TCP/IP Four Layers Architecture Model - Other Network Architecture Models: IBM SNA.

ROUTED AND ROUTING PROTOCOLS

Application Layer Protocols-Presentation Layer Protocols- Session Layer Protocols - Transport Layer Protocols - Network Layer Protocols - Data Link Layer Protocols - Routing Protocols - Multicasting Protocols - MPLS.

ISDN AND NETWORK MANAGEMENT PROTOCOLS

Overview of ISDN − Channels − User access – Protocols Network management requirements – Network monitoring − Network control − SNMP V1, V2 and V3 − Concepts, MIBs − Implementation issues-RMON. 58

SECURITY AND TELEPHONY PROTOCOLS

Network Security Technologies and Protocols - AAA Protocols - Tunneling Protocols - Security Protocols- rivate key encryption − Data encryption system, public key encryption − RSA − Elliptic curve cryptography − Authentication mechanisms− Web security -Secured Routing Protocols - IP telephony -Voice over IP and VOIP Protocols –Signaling Protocols- Media/CODEC.

NETWORK ENVIRONMENTS AND PROTOCOLS

Wide Area Network and WAN Protocols - Frame relay - ATM - Broadband Access Protocols - PPP Protocols - Local Area Network and LAN Protocols - Ethernet Protocols - Virtual LAN Protocols - Wireless LAN Protocols - Metropolitan Area Network and MAN Protocol - Storage Area Network and SAN Protocols.

REFERENCES:

1. Javvin, “Network Protocols” , Javvin Technologies Inc , second edition, 2005
2. William Stallings, “Cryptography and Network Security”, PHI, 2000.
3. Mani Subramanian, “Network Management−Principles and Practices”, Addison Wesley, 2000.
4. William Stallings, “SNMP, SNMPV2, SNMPV3 and RMON1 and 2”, 3rd Edition, Addison Wesley, 1999.
5. William Stallings, “Data and Computer Communications” 5th Edition, PHI, 1997

ECE 3103-(3) INTERNET & WEB TECHNOLOGY

(Core Elective-I)

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
3	3	0	-	3	30	70	100

HTML Common tags- List, Tables, images, forms, Frames; Cascading Style sheets; Java Script: - Introduction to Java Scripts, Objects in Java Script**,** Dynamic HTML with Java Script

XML: Document type definition, XML Schemas, Document Object model, Presenting XML, Using XML Processors: DOM and SAX.

Java Beans: Introduction to Java Beans, Advantages of Java Beans, BDK, Introspection, Using Bound properties, Bean Info Interface, Constrained properties Persistence, Customizes, Java Beans API, Introduction to EJB's

Web Servers and Servlets: Tomcat web server, Introduction to Servelets: Lifecycle of a Serverlet, The Servelet API, The javax.servelet Package, Reading Servelet parameters, and Reading Initialization parameters. The javax.servelet HTTP package, Handling Http Request & Responses, Using Cookies-Session Tracking, Security Issues

JSP Application Development: Generating Dynamic Content, Using Scripting Elements Implicit JSP Objects, Conditional Processing – Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods Error Handling and Debugging Sharing Data between JSP pages, Requests, and Users Passing Control and Date between Pages – Sharing Session and Application Data – Memory Usage Considerations

Database Access: Database Programming using JDBC, Studying Javax.sql.* package, Accessing a Database from Servlets & JSP Page , Application – Specific Database Actions, Deploying JAVA Beans in a JSP Page, Introduction to struts framework.

TEXT BOOKS:

1. Internet and World Wide Web – How to program by Dietel and Nieto PHI/Pearson Education Asia.
2. Advanced Java™ 2 Platform How to Program, Deitel/Deitel/Santry 3. Java Server Pages – Hans Bergsten, SPD O'Reilly

REFERENCE BOOKS:

1. HTML Black Book: The Programmer's Complete HTML Reference Book-by Steven Holzner
2. Core Servelets and Java Server Pages Volume2: Core Technologies by Marty Hall and Larry Brown, Pearson Education

ECE 3103-(4) SOFTWARE ENGINEERING

(Core Elective-I)

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
3	3	0	-	3	30	70	100

1. Software Engineering:
   Software related problems, software engineering, concepts, and development activities
2. Modelling:
   Concepts, Modelling with UML
3. Project Organization & Communication:
   Project Organization & communication concepts and their activities
4. Requirements:
   Requirements elicitation & its activities and managing requirements elicitation
5. Analysis:
   Analysis overview, concepts, activities and managing analysis
6. System Design:
   Design overview, concepts, and activities, addressing design goals and managing system design
7. Object Design:
   Object reuse, its activities & managing reuse, Interface specification concepts & its activities and Managing object design
8. Testing;
   Testing concepts, activities and managing testing
9. Software Configuration Management:
   Configuration Management overview, concepts, activities and managing configuration management

Text Book:

1. Object-Oriented Software Engineering: Using UML, Patterns and Java, Bernd Bruegge and Allen H. Dutoit, 2nd Edition, Pearson Education Asia

Reference Books:

1. Object-Oriented Software Engineering: Practical software development using UML and Java Timothy C. Lethbridge and Robert Laganiere , McGraw-Hill Higher education
2. An Introduction to Object Oriented Systems Analysis and Design with UML and the Unified Process, Stephen R Schach, Tata McGraw-Hill

ECE 3103-(5) OBJECT ORIENTED PROGRAMMING

(Core Elective-I)

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
3	3	0	-	3	30	70	100

1. Procedural Paradigms, Object Oriented Paradigm, Concept of Data Abstraction Encapsulation, Inheritance and Polymorphism, Introduction to U.M.L, Description of various U.M.L. Diagrams with examples.
2. Basics of Object Oriented Programming : benefits of OOP, data types, declarations, expressions and operator precedence, functions, scope of variables
3. Introduction to OOP: Classes and objects, Constructors & Destructors, Operator Overloading & type conversions.
4. Inheritance: Derived classes, syntax of derived classes, making private members inheritable, single, multilevel, multiple, hierarchical, hybrid inheritance
5. Polymorphism: Pointers, virtual functions and polymorphism- pointers to objects, this pointer, pointers to derived classes, virtual and pure virtual functions.
6. Templates, Exception handling, console I/O and File I/O: class templates, Function templates, member function templates, exception handling, managing console I/O operations, and working with files.
7. Introduction to JAVA: Introduction, Classes and Objects, Arrays, strings and Vectors, Exception Handling, Managing I/O files in Java.
8. Packages and Interface, and Multi-threading: Packages, Interfaces, creating, extending, stopping, blocking threads, thread states, thread methods, exceptions, priority in threads, synchronization, Runnable interface.

Text Books:

1. JAVA 2.0- Complete Reference: Herbert Schildt& F. Naughton.
2. Introduction to JAVA PROGRAMMING by Y.Daniel Liang (PHI)
3. Object oriented Programming using C++: E. Balagurusamy, PHI.
4. Programming with JAVA- A primer: E. Balagurusamy, PHI
5. The Unified Modeling Languages user Guide by Grady BoochEtal.(Pearson Education)

References:

1. Object Oriented Programming in C++: N. Barkakati, PHI
2. Object Oriented Programming through C++ by RobatLaphore.
3. Object Oriented Analysis and Design by Andrew Haigh – (Tata McgrahHjill.)

ECE 3104 ANTENNAS AND WAVE PROPAGATION

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
3	3	0	-	3	30	70	100

1. Radiation and Antennas

Antenna definition and Functions, Network theorems, Properties of antennas, Antenna parameters , Polarization, Basic antenna elements , Radiation mechanism, Radiation fields of alternating current element, Radiated power and radiation resistance of current element, Radiation, induction and electrostatic fields, Hertzian dipole, Different current distributions in linear antennas, Radiation from half-wave dipole, Radiation from quarter wave monopole , Radiation characteristics of dipoles.

2. Analysis of Linear Arrays

Directional characteristics of dipole antennas, Radiation pattern of alternating current element, Radiation pattern expressions of centre-fed vertical dipoles of finite length, Radiation patterns of centre-fed vertical dipoles, Radiation patterns of centre-fed horizontal dipoles, Radiation patterns of vertical dipoles, Two-element uniform array, Uniform linear arrays, Field strength of a uniform linear array, First sidelobe ratio (SLR), Broadside and End-fire arrays, Patterns of array of non-isotropic radiators, Multiplication of patterns, Generalized expression for principle of pattern multiplication, Radiation pattern characteristics, Binomial arrays, Effect of earth on vertical patterns, Effect of earth on radiation resistance, Methods of excitation, Impedance matching techniques, Transmission loss between transmitting and receiving antennas - FRIIS formula, Antenna temperature and signal-to-noise ratio.

3. Array Synthesis

Introduction, Synthesis methods, Fourier transform method, Linear array design by Woodward-lawson method, Dolph-chebychev method (Tschebyscheff distribution), Taylor method, Laplace transform method, Standard amplitude distributions.

4. HF, VHF and UHF Antennas

Introduction, Isotropic radiators, Directional antennas, Omni-directional antennas, Resonant antennas, Nonresonant antennas, LF antennas, Antennas for HF, VHF and UHF, Dipole arrays, Folded dipole, V-Antennas, Inverted V-antennas, Rhombic antenna, Yagi-Uda antenna, Log-periodic antennas, Loop antenna, Helical antenna, Whip antenna, Ferrite rod antenna, Turnstile antennas, Discone antennas, Notch antenna.

5. Microwave Antennas and Antenna Measurements

Introduction, Rod reflector, Plane reflector, Corner reflector, Parabolic reflector, Types of parabolic reflectors, Feed systems for parabolic reflectors, Shaped beam antennas, Horn antennas, Corrugated horns, Slot antennas, Impedance of a few typical dipoles, Slots in the walls of rectangular waveguides, Babinet's principle, Lens antennas, Microstrip antennas , Measurement ranges, Indoor and outdoor ranges, Antenna impedance measurements, Measurement of radiation resistance, Gain measurements, Measurement of antenna bandwidth, Directivity measurement, Measurement of sidelobe ratio, Measurement of radiation efficiency, Measurement of antenna aperture efficiency, Measurement of polarization of antenna, Phase measurement.

6. Wave Propagation

Propagation characteristics of EM Waves, Factors involved in the propagation of radio waves, Ground wave propagation, Ground wave field strength by Maxwell's equations, Reflection of radio waves by the surface of the earth, Roughness of earth, Reflection factors of earth, Wave tilt of the ground wave, Tropospheric wave propagation, Atmospheric effects in space wave propagation, Duct propagation, Radio horizon, Troposcatter, Fading of EM waves in Troposphere, Line of sight (LOS), Ionospheric propagation, Characteristics of ionosphere, Refractive index of ionosphere, Phase and group velocities, Mechanism of Ionospheric propagation, reflection and refraction, Characteristic parameters of Ionospheric propagation, Sky wave field strength, Fading and diversity techniques, Faraday's rotation, Effect of earth's magnetic field.

Text Book:

1. Antennas and Wave Propagation, G.S.N. Raju, Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2007.

References:

1. EM Waves and Radiation Systems, E. C. Jordan and K. G. Balmain, PHI – N. Delhi, 1997.
2. Antennas, J.D. Kraus, McGraw Hill, NY.
3. Antenna theory, C.A. Balanis, John Wiley & Sons, NY, 1982.

ECE 3105 PULSE AND DIGITAL CIRCUITS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
3	3	0	-	3	30	70	100

UNIT- I:

LINEAR WAVE SHAPING: High pass and Low pass RC circuits, Response of High pass and Low pass RC circuits to sinusoidal, step, pulse, square, exponential and Ramp inputs, High pass RC circuit as a differentiator, Low pass RC circuit as an integrator. Attenuators and its application as CRO probe, RL and RLC Circuits and their response for step input, Ringing Circuit.

UNIT- II:

NONLINEAR WAVE SHAPING: Diode clippers, Transistor Clippers, Clipping at two independent levels, Comparator, Applications of voltage Comparators, Diode Comparator, Clamping Operation, Clamping Circuits using Diode with Different Inputs, Clamping Circuit Theorem, Practical Clamping circuits, Effect of diode Characteristics on Clamping Voltage.

UNIT- III:

BISTABLE MULTIVIBRATORS: Transistor as a switch, Switching times of a transistor, Design and Analysis of Fixed-bias and self-bias transistor binary, Commutating capacitors, Triggering schemes of Binary, Transistor Schmitt trigger and its applications.

UNIT- IV:

MONOSTABLE AND ASTABLE MULTIVIBRATORS: Design and analysis of Collector coupled Monostable Multivibrator, Expression for the gate width and its waveforms. Design and analysis of Collector coupled Astable Multivibrator, expression for the Time period and its waveforms, The Astable Multivibrator as a voltage to frequency convertor.

UNIT- V:

TIME BASE GENERATORS: General features of a time-base signal, Methods of Generating time base waveform, Exponential voltage sweep circuit, Basic principles of Miller and Bootstrap time base generators, transistor Miller sweep generator, transistor Bootstrap sweep generator, Current Sweep circuit, Linearity correction through adjustment of driving Waveform.

UNIT VI:

SYNCHRONIZATION AND FREQUENCY DIVISION: Principles of Synchronization, Frequency division in sweep circuit, Synchronization of Astable Multivibrators, Synchronization of a sweep circuit with symmetrical signals, Sine wave frequency division with a sweep circuit.
LOGIC GATES: Realization of gates using diodes and Transistors, RTL, DTL.

Text Books:

1. Pulse Digital and Switching Waveforms, J. Millman and H. Taub, McGraw-Hill, 2nd Edition 1991.
2. Pulse switching and digital circuits – David A.Bell,PHI ,5thEdn., oxford university press.

References:

1. Pulse and Digital Circuits, K.VenkatRao, Pearson Education India, 2nd Edition, 2010.
2. Pulse and Digital Circuits, A. Anand Kumar, PHI, second edition, 2005.

ECE 3106 DIGITAL SIGNAL PROCESSING

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
3	3	0	-	3	30	70	100

1. Discrete - Time Signals and Systems:

Discrete - Time Signals – Sequences, Linear Shift – Invariant Systems, Stability and Casuality, Linear Constants – Coefficient Difference Equations, Frequency Domain Representation of Discrete – Time Signals and Systems.

2. Applications of Z – Transforms:

System Functions H(z) of Digital Systems, Stability Analysis, Structure and Realization of Digital Filters, Finite Word Length Effects.

3. Discrete Fourier Transform (DFT):

Properties of the DFS, DFS Representation of Periodic Sequences, Properties of DFT, Convolution of Sequences.

4. Fast – Fourier Transforms (FFT):

Radix – 2 Decimation – In – Time (DIT) and Decimation – In – Frequency (DIF), FFT Algorithms, Inverse FFT.

5. IIR Digital Filter Design Techniques:

Design of IIR Filters from Analog Filters, Analog Filters Approximations (Butterworth and Chebyshev Approximations), Frequency Transformations, General Considerations in Digital Filter Design, Bilinear Transformation Method, Step and Impulse Invariance Technique.

6. Design of FIR Filters:

Fourier series Method, Window Function Techniques, Comparison of IIR and FIR Filters.

7. Applications:

Applications of FFT in Spectrum Analysis and Filtering, Application of DSP in Speech Processing.

Text Book:

1. Alan V. Oppenheim and Ronald W. Schafer: Digital Signal Processing, PHI.

References:

1. Sanjit K. Mitra, Digital Signal Processing "A – Computer Based Approach", Tata Mc Graw Hill.
2. Raddar and Rabiner, Application of Digital Signal Processing.
3. S. P. Eugene Xavier, Signals, Systems and Signal Processing, S. Chand and Co. Ltd.
4. Antonio, Analysis and Design of Digital Filters, Tata Mc Graw Hill.

ECE 3107 SOFT SKILLS

ECE 3108 LINEAR IC'S AND PULSE CIRCUIT LABORATORY

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
1.5	-	-	3	3	50	50	100

LIST OF EXPERIMENTS

1. Linear wave shaping
2. Non-linear wave shaping
3. UJT as a Relaxation oscillator
4. Measurement of parameters of Op-amp
5. Schmitt trigger
6. Frequency response of Active filters
7. Op-amp as Wave form generator
8. IC-555 as an Astable Multi vibrator
9. Study of Instrumentation Amplifier
10. Voltage regulator using IC-723
11. Monostable Multi vibrator using IC-555.

ECE 3109 ANALOG COMMUNICATION LABORATORY

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
1.5	-	-	3	3	50	50	100

LIST OF EXPERIMENTS

1. AM M Modulation and Demodulation
2. Low Pass Filter using passive components
3. High Pass Filter using passive components
4. Active Notch Filter
5. Frequency Modulation and Demodulation
6. Pre-emphasis and De-emphasis
7. T – Type attenuator
8. Band pass filter using passive components
9. Mixer characteristics
10. SSB-SC modulation and demodulation.

ECE 3201 COMPUTER NETWORKS ENGINEERING

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
3	3	0	-	3	30	70	100

1. Introduction:

   Uses of Computer Networks, Network Structure, Architectures, Services, Standardization, Functions of Various Network Layers, Network examples.

2. Physical layer:

   Theoretical Basis for Data Communication, Transmission Media, Analog and Digital Transmission, Transmission and Switching ISDN.

3. Medium Access Sub-layer:

   LAN, MAN, Protocol, ALOHA, IEEE Standard for 802 for LANs, Fiber Optic Networks, Satellite Networks.

4. Data Link layer:

   Design Issues, Error Detection and Correction, Protocols and their Performance, Specifications and Examples.

5. Network layers:

   Design Considerations, Difference between Gateway, Ethernet Switch, Router, Hub, Repeater, Functions of Router, Congestion Control Internetworking and Examples, Details of IP addressing schemes, TCP/IP Protocol details.

6. The Transport Layer:

   The Transport Service, Elements of Transport Protocols, The Internet Transport Protocols; UDP, The Internet Transport Protocols; TCP.

   The Application Layer:

   The Domain Name System, Electronic Mail, The World Wide Web.

Books:

1. Data Communications and Networking by Behrouz A. Forouzan, 2nd Edition, Tata McGraw Hill.

References:

1. Computer Networks, A. S. Tannenbaum, PHI – New Delhi.

2. Computer Networking Terminology Products and Standards, R. P. Suri and J. K. Jain, Tata McGraw Hill.

ECE 3202 MICROPROCESSORS AND MICROCONTROLLERS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
3	3	0	-	3	30	70	100

UNIT-I: 8086/8088 MICROPROCESSORS

Register organization of 8086, Architecture, signal description of 8086, physical memory organization, general bus operation, I/O addressing capability, special purpose activities, Minimum mode, maximum mode of 8086 system and timings, the processor 8088, machine language instruction formats, addressing mode of 8086, instruction set off 8086,assembler directives and operators.

UNIT-II: PROGRAMMING WITH 8086 MICROPROCESSOR

Machine level programs, programming with an assembler, Assembly language programs, introduction to stack, stack structure of 8086/8088, interrupts and interrupt service routines, interrupt cycle of 8086, non-mask able interrupt and mask able interrupts, interrupt programming.

UNIT-III: BASIC AND SPECIAL PURPOSE PROGRAMMABLE PERIPHERALS AND THEIR INTERFACING WITH 8086/88

Semiconductor memory interfacing, dynamic RAM interfacing, interfacing i/o ports, PIO 8255 modes of operation of 8255,interfacing to D/A and A/D converters, stepper motor interfacing, control of high power devices using 8255.Programmable interrupt controller 8259A, the keyboard /display controller8279, programmable communication interface 8251 USART, DMA Controller 8257.

UNIT-IV: ADVANCED MICRO PROCESSORS

Salient features of 0386DX, architecture and signal description of 80386, register organization of 80386 and addressing modes, data types of 80386, real address mode of 80386, protected mode of 80386, segmentation and Paging, virtual 8086 mode and enhanced mode. Instruction set of 80386.The coprocessor 80387.

UNIT-V: 8051 MICROCONTROLLER

Introduction to microcontrollers, 8051Microcontrollers, 8051pin description, connections, I/O ports and memory organization, MCS51addressing modes and instructions, assembly language programming tools.

UNIT-VI: PIC MICROCONTROLLERS AND ARM 32-BIT MICROCONTROLLER

Overview and features, PIC16Cx/7X instructions, interrupts in PIC 16C61/71, PIC 16F8XX Flash controllers, I/O ports and timers. Introduction to 16/32 Bit processors, ARM architecture and organization, ARM / Thumb programming model, ARM / Thumb instruction set.

TEXT BOOKS:

1. A.K.Ray, K.M.Bhurchandi ,"Advanced Microprocessors and Peripherals", Tata McGraw Hill Publications, 2000.

2. N.Sentil Kumar, M.Saravanan, S.Jeevananthan, “Microprocessors and Microcontrollers”, OxfordUniversity Press, 2010.

REFERENCES:

1. Ajay V Deshmukh, ”Microcontrollers”, TATA McGraw Hill publications, 2012.
2. Krishna Kant, “Microprocessors and Microcontrollers”, PHI Publications, 2010.

ECE 3203 DIGITAL COMMUNICATIONS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
3	3	0	-	3	30	70	100

1. Analog-to-Digital Conversion: Pulse modulation techniques, Sampling, Time Division Multiplexing, Pulse Amplitude Modulation, Pulse Width Modulation, Pulse Position Modulation, Digital Modulation Techniques: Pulse Code Modulation, Differential Pulse Code Modulation, Delta Modulation, Adaptive Delta Modulation, Continuously Variable Slope Delta Modulation, Companding, Noise in Pulse-Code and Delta-Modulation Systems.
2. Binary Phase-Shift Keying, Differential Phase-Shift Keying, Differentially-Encoded PSK (DEPSK), Quadrature Phase-Shift Keying (QPSK), M-ary PSK, Quadrature Amplitude Shift Keying (QASK), Binary Frequency Shift-Keying, Similarity of BFSK and BPSK, M-ary FSK, Minimum Shift Keying (MSK), Duo-binary Encoding.
3. Mathematical Representation of Noise:Some Sources of Noise, Frequency-Domain Representation of Noise, The Effect of Filtering on the Probability Density of Gaussian Noise, Spectral Components of Noise Response of a Narrowband Filter to Noise, Effect of a Filter on the Power Spectral Density of Noise, Superposition of Noises, Mixing Involving Noise, Linear Filtering, Noise Bandwidth, Quadrature Components of Noise, Power Spectral Density of n(t) and n(t), Probability Density of n(t), n(t), and their Time Derivatives, Representation of Noise Using Orthonormal Coordinates, Irrelevant Noise Components
4. Data Transmission: A Base-band Signal Receiver, Probability of Error, The Optimum Filter, White Noise: The Matched Filter, Probability of Error of the Matched Filter, Coherent Reception: Correlation, Phase-Shift Keying, Frequency-Shift Keying, Non-coherent Detection of FSK, Differential PSK, Four Phase PSK (QPSK), Error Probability for QPSK, Probability of Error of Minimum Shift Keying (MSK), Comparison of Modulation Systems.
5. Spread Spectrum Modulation: Direct Sequence (DS) Spread Spectrum, Use of Spread Spectrum with Code Division, Multiple Access (CDMA), Ranging using DS Spread Spectrum, Frequency Hopping (FH) Spread Spectrum, Generation and Characteristics of PN Sequences, Acquisition (Coarse Synchronization) of a FH Signal, Tracking (Fine Synchronization) of a FH Signal, Acquisition (Coarse Synchronization) of a DS Signal, Tracking of a DS Signal.

Text Books:

1. Analog and Digital Communication Systems by Martin S. Roden, 3rd edition, Prentice Hall, 1994;
2. Principles of Communications By Taub and Schilling.

ECE 3204-(1) WIRELESS SENSORS & NETWORKS

(Core Elective-II)

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
3	3	0	-	3	30	70	100

UNIT I

OVERVIEW OF WIRELESS SENSOR NETWORKS:

Key definitions of sensor networks, Advantages of sensor Networks, Unique constraints an challenges, Driving Applications, Enabling Technologies for Wireless Sensor Networks.

ARCHITECTURES:

Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture -Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT II

NETWORKING Technologies:

Physical Layer and Transceiver Design Considerations, Personal area networks (PANs), hidden node and exposed node problem, Topologies of PANs, MANETs, WANETs.

UNIT-III

MAC Protocols for Wireless Sensor Networks:

Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad-Hoc Wireless Networks, Classifications of MAC Protocols, Contention - Based Protocols, Contention – Based Protocols with reservation Mechanisms, Contention – Based MAC Protocols with Scheduling Mechanisms,

MAC Protocols that use Directional Antennas, Other MAC Protocols.

UNIT-IV

R OUTING PROTOCOLS:

Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table –Driven Routing Protocols, On – Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols, Proactive Routing.

UNIT-V

TRANSPORT LAYER AND SECURITY PROTOCOLS:

Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks.

UNIT- VI

SECURITY IN WSNs:

Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad Hoc Wireless Networks.

SENSOR NETWORK PLATFORMS AND TOOLS:

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node level Simulators, State-centric programming.

APPLICATIONS of WSN:

Ultra-wide band radio communication, Wireless fidelity systems. Future directions, Home automation, smart metering Applications.

TEXT BOOKS:

1. Ad Hoc Wireless Networks: Architectures and Protocols - C. Siva Ram Murthy and B.S.Manoj, 2004, PHI
2. Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control – JagannathanSarangapani, CRC Press
3. Holger Karl & Andreas Willig, “Protocols And Architectures for Wireless Sensor Networks", John Wiley, 2005.

REFERENCES:

1. KazemSohraby, Daniel Minoli, &TaiebZnati, “Wireless Sensor Networks- Technology, Protocols, and Applications”, John Wiley, 2007.
2. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.
3. Ad- Hoc Mobile Wireless Networks: Protocols & Systems, C.K. Toh ,1 ed. Pearson Education.
4. Wireless Sensor Networks - C. S. Raghavendra, Krishna M. Sivalingam, 2004, Springer.
5. Wireless Sensor Networks – S Anandamurugan , Lakshmi Publications

ECE 3204-(2) MICROELECTRONICS

(Core Elective-II)

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
3	3	0	-	3	30	70	100

Integrated- Circuit Fabrication:

Monolithic Integrated - Circuit (microelectronics) technology- The planar processes - Bipolar Trasister Fabrication - Fabrication of FETs - CMOS Technology - Monolithic Diods - The Metal – Semiconductor Contact - IC Resistor - IC Capacitors - IC Packaging - Characteristics of IC Components – Microelectronic circuit layout.

Basic Digital circuits:

MOS Technology - NMOS, CMOS, Iverters, Logic gates - ECL circuits.

Combinational Circuits:

Arithmetic functions - Comparators - Multiplexers - Demultiplexers - Memory - Memory applications – PAL - PLAs.

Sequential Circuits:

A1 - Bit memory - The circuits properties of biastable latch - The clocked SR Flip-Flop - J-K, T, and D-type Flip-flops. Shift-registers - Ripple Counters - synchronous counters - Applications of counters.

Text Book:

1. Microelectronic by JocobMilliman, ArbinGrabel second edition, TMH.

References:

1. Part 2 of Integrated Circuits, Design Principles and Fabrications by editors, Warner and Fordemwalt, 1965, Motorola Series, McGraw Hill.

2. MOS LSI Design and Applications by Dr. William N. Carr and Dr. Jack P. Mize, McGraw Hill, 1972.

3. Microelectronic circuits and devices second edition Horenstien, PHI.

ECE 3204-(3) EMI/EMC

(Core Elective-II)

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
3	3	0	-	3	30	70	100

1. Introduction to EMI/EMC:

   EMI Sources, EMI Coupling, Noise Path, Models of Noise Coupling, EMC Regulations, Designing for EMC, Compliance Tests, Elimination of EMI, EMI Testing, Compliance Test and Engineering Tests.

2. Grounding Techniques, Shielding Techniques, Cabling Techniques.

3. Conducted EMI/EMC:

   Origin of Conducted EMI, Common and Normal mode Noise, Noise from Power Electronic Systems, Spectra of Pulse Noise Sources, Modeling of EMI Noise Sources, Transient Disturbance Simulation Signals, EMI Filters for Mains Noise.

4. Choice of Passive Components:

   EMC Design Components

5. EMI Measurement Technology:

   EMI Measuring Instruments, Pitfalls of EMI Measurements, Test Instrumentation Accessories and their Characteristics, Measurement of Pulsed EMF, EMI Patterns from Different List Objects, EMI Immunity Test System, Software in EMI/EMC Measurements, Recent Trends in Susceptibility Measurement, Cost Effective EMI/EMC Measurements, Setup and its Maintenance.

Text Books:

1. IMPACT Learning Material Series Modules 1 – 9, IIT New Delhi, Published by RSTE.
2. Electromagnetic Compatibility, R. C. Paul.

ECE 3204-(4) DSP PROCESSORS & ARCHITECTURES

(Core Elective-II)

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
3	3	0	-	3	30	70	100

1. INTRODUCTION TO DIGITAL SIGNAL PROCESING

Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation, Analysis and Design tool for DSP Systems MATLAB, DSP using MATLAB.

2. COMPUTATIONAL ACCURACY IN DSP IMPLEMENTATIONS

Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

3. ARCHITECTURES FOR PROGRAMMABLE DSP DEVICES AND EXECUTION

Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities.

Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing, Hardware looping, Interrupts, Stacks, Relative Branch support, Pipelining and Performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects, Pipeline Programming models

4. PROGRAMMABLE DIGITAL SIGNAL PROCESSORS

Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

5. IMPLEMENTATIONS OF BASIC DSP ALGORITHMS

The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing, An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and scaling, Bit-Reversed index generation, An 8-Point FFT implementation on the TMS320C54XX, Computation of the signal spectrum

6. INTERFACING MEMORY AND I/O PERIPHERALS TO PROGRAMMABLE DSP DEVICES

Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA). A Multichannel buffered serial port (McBSP), McBSP Programming, a CODEC interface circuit, CODEC programming, A CODEC-DSP interface example.

TEXT BOOKS:

1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. S. Chand & Co, 2000.

REFERENCES:

1. Digital Signal Processors, Architecture, Programming and Applications – B. VenkataRamani and M.Bhaskar, TMH, 2004.
2. Digital Signal Processing – Jonatham Stein, John Wiley, 2005.

ECE 3204-(5) ELECTRONIC MEASUREMENTS & INSTRUMENTATION

(Core Elective-II)

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
3	3	0	-	3	30	70	100

BASIC MEASUREMENT CONCEPTS

Measurement systems – Static and dynamic characteristics – error analysis – moving coil meters – DC ammeters, DC voltmeters, Series type ohmmeter, Shunt type ohmmeter, multimeter - moving iron meters – Bridge measurements – Wheatstone, Kelvin, Guarded Wheatstone, Maxwell, Hay, Schering, Anderson and Wein bridge.

BASIC ELECTRONIC MEASUREMENTS

AC voltmeters using rectifiers, True RMS responding voltmeter, Electronic multimeter – Comparison of analog and digital techniques – digital voltmeter - Ramp, Stair case ramp, Integrating, Continuous balance, Successive approximation.

DIGITAL INSTRUMENTS

Frequency counters – measurement of frequency and time interval – extension of frequency range – measurement errors - Cathode ray oscilloscopes – block schematic – applications – special oscilloscopes – Storage and sampling oscilloscopes – wave analyzer - distortion analyzer - spectrum analyzer – Q meters.

TRANSDUCERS

Introduction, Classification of transducers, Analog transducers, Resistive transducers, Potentiometers, Strain gauges, Types of strain gauges, Resistance strain gauges, Semiconductor strain gauges, Resistance thermometers, Thermometers, Application of Thermistors, Thermo-couple construction, Measurement of thermocouple output, Compensating circuits, Advantages and disadvantages of thermocouples, Variable inductance type transducer, Variation of self-inductance, Variation of mutual inductance, Linear variable differential transformer, Rotary variable differential transformer, Capacitive transducers, Piezo-electric transducers, Digital transducers, Shaft Encoder.

TEXT BOOK

1. Albert D. Helfrick and William D .Cooper – Modern Electronic Instrumentation and Measurement Techniques, Prentice Hall of India, 2003.
2. A K Sawahney, Electrical And Electronics Measurement and Instrumentation, Dhanpat Rai,2000

REFERENCES

1. H S Kalsi, Electronic instrumentation, TMH, 1995.
2. Ernest O. Doebelin, Measurement Systems- Application and Design-Tata McGraw-Hill-2004.
3. Oliver B.M. & Cage – Electronic Measurements & Instrumentation -Tata McGraw Hill
4. K Padma Raju,Y J Reddy, Instrumentation and Control Systems, McGraw Hill Education,2016

ECE 3205 DIGITAL IMAGE PROCESSING

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
3	3	0	-	3	30	70	100

UNIT-1

Introduction: Origins of digital image processing, uses digital image processing, fundamental steps in digital image processing, components of an image processing system, digital image fundamentals, Elements of visual perception, light and electromagnetic spectrum, imaging sensing and acquisition, image sampling and quantization. Some basic relationships between pixels, and introduction to the mathematical tools used in digital image processing.

Image Transforms: Need for image transforms, Spatial Frequencies in image processing, introduction to Fourier transform, discrete Fourier transform, fast Fourier transform and its algorithm, properties of Fourier transform. Discrete sine transforms. Walsh Transform. Hadamard transform, Haar Transform. Slant transforms, SVD and KL Transforms or Hotelling Transform

UNIT-2

Intensity Transformations and Spatial Filtering: Background, Some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters, sharpening spatial filters, combining spatial enhancement methods, using fuzzy techniques for intensity transformations and spatial filtering.

Filtering in the frequency domain: Preliminary concepts, Sampling and theFourier transform of sampled functions, the discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, some properties of the 2-D Discrete Fourier transform. The Basic of filtering in the frequency domain, image smoothing using frequency domain filters, Selective filtering, Implementation.

UNIT-3

Image restoration and Reconstruction: A model of the image degradation /Restoration process, Noise models, restoration in the presence of noise only-Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear, Position –Invariant Degradations, Estimation the degradation function, Inverse filtering,

Minimum mean square error (Wiener) filtering, constrained least squares filtering, geometric mean filtering, image reconstruction from projections.

UNIT-4

Color image processing: color fundamentals, color models, pseudo colorimage processing, basic of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression.

UNIT-5

Wavelets and Multi-resolution Processing: image pyramids, sub band coding & Haar transforms multi resolution expressions, wavelet transforms in one dimensions. The fast wavelets transform, wavelet transforms in two dimensions, wavelet packets.

Image compression: Fundamentals, various compression methods-coding techniques, digital image water marking.

UNIT-6

Morphological image processing: preliminaries Erosion and dilation, opening and closing, the Hit-or-miss transformation, some Basic Morphological algorithms, grey –scale morphology

Image segmentation: Fundamentals, point, line, edge detection thresholding, region –based segmentation, segmentation using Morphological watersheds, the use of motion in segmentation**.**

TEXT BOOKS:

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.
2. R. C. Gonzalez, R. E. Woods and Steven L. Eddins , Digital Image Processing Using MATLAB , 2rd edition, Prentice Hall, 2009.
3. Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 9th Edition, Indian Reprint, 2002.
4. Jayaraman, S. Esakkirajan, and T. Veerakumar, Digital Image Processing, Tata McGraw-Hill Education.

ECE 3206 CONTROL SYSTEMS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
3	3	0	-	3	30	70	100

1. Transfer Functions of Linear Systems – Impulse Response of Linear Systems – Block Diagrams of Control Systems – Signal Flow Graphs (Simple Problems) – Reduction Techniques for Complex Block Diagrams and Signal Flow Graphs (Simple Examples).

2. Basic Structure of a Feedback Control Systems-Introduction to Mathematical Modelling of Physical Systems – Equations of Electrical Networks – Modelling of Mechanical Systems – Equations of Mechanical Systems, Analogous Systems- Feedback Control System Characteristics.

3. Time Domain Analysis of Control Systems – Time Response of First and Second Order Systems with Standard Input Signals – Steady State Error Constants – Effect of Derivative and Integral Control on Transient and Steady State Performance of Feedback Control Systems.

4. Concept of Stability and Necessary Conditions for Stability – Routh-Hurwitz Criterion, Relative Stability Analysis, the Concept and Construction of Root Loci, Analysis of Control Systems with Root Locus (Simple Problems to understand theory).

5. Correlation between Time and Frequency Responses – Polar Plots – Bode Plots – Log Magnitude versus Phase Plots – All Pass and Minimum Phase Systems – Nyquist Stability Criterion – Assessment of Relative Stability – Constant M and N Circles.

Text Books:

1.Automatic Control Systems, Benjamin C. Kuo, PHI Publication (5th Edition).

2. Control Systems Engineering, I. J. Nagrath and M. Gopal, Wiley Eastern Ltd.

Reference Books:

1. Modern Control Engineering, Ogata, PHI.

2. Control Systems Principles and Design, M.Gopal, McGrawHill.

ECE 3207 CELLULAR MOBILE COMMUNICATION

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

INTRODUCTION:

Evolution of Mobile Communications, Mobile Radio Systems around the world, First, Second, Third Generation Wireless Networks, Wireless Local Loop(WLL), Wireless LANs, Bluetooth, Personal Area Networks(PANs),Examples of Wireless Communication Systems, A Simplified Reference Model, Applications.

WIRELESS TRANSMISSION TECHINIQUES:

Frequencies for radio transmission, Signals, Antennas, Signal Propagation, Multiplexing, Modulation Techniques: ASK, PSK, FSK, Advanced ASK, Advanced PSK, Multicarrier, Spead Spectrum: Direct sequence and Frequency hopping, Medium Access control- SDMA, FDMA, TDMA, CDMA, Comparison of S/F/T/CDMA.

THE CELLULAR CONCEPT:

Introduction, Frequency reuse, Handoff strategies, Interference and System Capacity: Co-Channel Interference, Channel Planning, Adjacent Channel Interference, Power control for reducing interference, Trunking and Grade of Service, Cell Splitting, Sectoring, Repeaters for Range extension, A microcell zone concept.

MOBILE RADIO PROPAGATION:

Introduction, Free space propagation model, The three basic propagation models-Reflection, Diffraction and Scattering, Two-ray model, Outdoor propagation models, Indoor propagation models, Signal Penetration into building, Small scale multipath Propagation, Parameters of Mobile multipath channels, Types of small scale fading.

TELECOMMUNICATION SYSTEMS:

GSM: Mobile Services, System Architecture, Radio interface, Protocols, Localization and Calling, Handover, Security, New data services, UMTS and IMT-2000: Releases and Standardization, System Architecture, Radio interface, UTRAN, Handover.

Textbooks:

1. Mobile Cellular Communication by Gottapu Sasibhushana Rao, PEARSON International, 2012.

References:

1. Mobile Communications-Jochen Schiller, Pearson education, 2nd Edn, 2004.
2. Wireless Communications: Principles and Practice-Theodore. S. Rapport, Pearson education, 2nd Edn, 2002.
3. Mobile Cellular Telecommunications-W.C.Y.Lee, Tata McGraw Hill, 2nd Edn, 2006.
4. Wireless and Mobile Communications-Lee, McGraw Hill, 3rd Edition, 2006.
5. Wireless Communications and Networks-William Stallings, Pearson Education, 2004.

ECE 3208 DIGITAL SIGNAL PROCESSING LABORATORY

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
1.5	-	-	3	3	50	50	100

LIST OF EXPERIMENTS

MAT LAB EXPERIMENTS:

1. Generation of discrete –time sequences
2. Implementation of Discrete time systems
    a) Linear Convolution of two sequences
    b) Circular Convolution of two sequences
3. Frequency analysis of discrete time sequences
4. Frequency analysis of discrete time systems
5. Design of IIR digital filter
    a) Butterworth
    b) Chebyshev
6. Design of FIR digital filter
    a) Hamming window
    b) Rectangular window

HARDWARE EXPERMENTS:

1. Verification of Linear Convolution using DSP Processor kit
2. Verification of Circular Convolution using DSP Processor kit
3. Implementation of IIR Filters on DSP Processor
4. Implementation of FIR Filters using Window Techniques on DSP Processor

ECE 3209 MICROPROCESSORS & MICROCONTROLLERS LAB LABORATORY

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
1.5	-	-	3	3	50	50	100

LIST OF PROGRAMS 8086 ESA-86/88 KIT PROGRAMMING

1. Write a Program to add two 16 bit numbers stored in two memory locations 2000h and 2002h and store the result in another memory location 2004h.
2. Write a Program to divide two 16 bit numbers stored in two memory locations 2000h and 2002h and store the result in another memory location 2004h.
3. Write a Program to multiply two 16 bit numbers stored in two memory locations 2000h and 2002h and store the result in another memory location 2004h.
4. Write a Program to add two 32 bit numbers stored in two memory locations 2000h and 2004h and store the result in another memory location 2008h.
5. Write a program to find factorial of a given number.

8086 PROGRAMMING USING MASM32 ASSEMBLER

6. Write a program to perform addition operation on two multibyte numbers.
7. Write a program to perform subtraction operation on two multibyte numbers.
8. Write a program to sort a given set of hexadecimal numbers.
9. Write a program to find whether the given string is a palindrome or not.
10. Write a program for inserting an element at a specified location in a given string.
11. Write a program to convert BCD numbers into equivalent binary value.Write a subroutine for the conversion.
12. Write a program to read a keyboard and display the characters on the PC screen using DOS/BIOS commands.

8051 PROGRAMMING USING KEIL SIMULATOR

13. Write a program to generate a square wave of 50% duty cycle at pin P2.1 using timer 0 in mode1.Assume XTAL=11.0592MHz.
14. Write a program to send a message “WELCOME” serially at 9600 baud rate continuously through serial port of 8051.

8086 INTERFACING

15. Write a program to interface stepper motor.
16. Write a program to interface keyboard with 8279 display controller.

ECE 4101 PRINCIPLES OF ECONOMICS AND MANAGEMENT

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
3	3		-	3	30	70	100

1. Introduction to Managerial Economics – Wealth, Welfare and scarce definition of Economics – Micro and Macro Economics; Demand – Law of Demand – Elasticity of Demand, Types of Elasticity and Factors determining price elasticity of Demand : Utility-Law of diminishing Marginal Utility and its limitations.
2. Conditions of Different Market Structures: - Perfect competition, Monopolistic competition, Monopoly, oligopoly and Duopoly.
3. Forms of business organizations: - Sole Proprietorship, Partnership, Joint Stock Company – Private Limited and public limited companies, Public enterprises and their types.
4. Introduction to Management: - Functions of Management – Taylors Scientific Management. Henry Falol's Principals of Management: Human resource management – basic functions of HR manager: manpower planning, recruitment, selection, training; development, placement, compensation, and performance appraisal (in Brief)
5. Production management – Production planning and control, plant location, break-even analysis, assumptions and applications.
6. Financial management – types of capital, fixed and working capital and methods of raising finance; depreciation: straight line and diminishing balance methods. Market management – functions of marketing and distribution channels.
7. Entrepreneurship – Entrepreneurial functions, entrepreneurial development objectives, training, benefits; phases of installing a project.

Text Books:

1. K.K.DEWETT, Modern Economic Theory, S.Chand and Co., New Delhi 55
2. S.C. SHARMA and BANGA T.R., Industrial Organisation & Engineering Economics, Khanna Publications, Delhi 6

Reference Books:

1. A.R.Aryasri, Management Science, Tata McGrah-Hill, New Delhi 2012

ECE 4102 INFORMATION THEORY AND CODING

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
3	3	-	-	3	30	70	100

1. Information measure and source coding, Information measure, Entropy and Information rate, Coding for a discrete memory less source, Predictive coding for sources with memory, Information transmission on discrete channels, Mutual information.

   Discrete channel capacity, coding for the binary symmetric channel, Continuous channels and system comparisons , continuous information, continuous channel capacity, Ideal communication system , system comparisons.

2. Rationale for coding , and types of codes, Discrete memory less channels, linear block codes , cyclic codes, convolution codes, Maximum likely hood Decoding of Convolution codes, Distance properties of convolution codes.

   Sequential Decoding of Convolution codes, Trellis codes, Applications , Algebraic codes, Burst error correcting, Parity check bit coding for error detection, comparison of error rates in coded and un coded transmission, Automatic repeat request.

Text Books:

1) Communication Systems,3/e, by A.B. Carlson, Mc. Graw Hill Publishers(for topic1)
2) Digital Communications by Simon Haykin , John Wiley & Sons(for topic 2)

References:

1) Principles of Digital Communications, Signal representation, Detection , Estimation &Information
2) Coding by J Das, S.K. Mullick, P.K.Chatterjee, New Age Int. Ltd.
3) Principles of Communication Systems, Taub &Schilling, 2/e, TMH Publishers

ECE 4103VLSI DESIGN

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

1. Review of microelectronics and an introduction to MOS technology:
   Introduction to IC technology, MOS and related VLSI technology, NMOS, CMOS, BiCMOS Technologies, Thermal aspects of processing, Production of E beam marks.

2. MOS and BiCMOS circuit design processes:
   MOS layers, ,Stick diagrams, Design rules, and layout, 2 & 1.2 micro meter CMOS rules, Layout diagrams, Symbolic diagram.

3. Basic Circuit concepts:
   Sheet resistance, Area capacitances of layers, Delay unit, Wiring Capacitances, Choice of layers.

4. Scaling of MOS Circuits:
   Scaling models, Scaling function for device parameters, Limitations of scaling.

5. Sub system design and Layout:

   Architectural issues, Switch logic, Examples of Structural design(Combinational logic).

6. Sub system design process:

   Design of ALU subsystem, Some commonly used storage elements, Aspects of design tools, Design for testability, Practical design for test guidelines, Built in self test, CMOS project-an incrementer / decrementer, a comparator for two n-bit numbers. Ultra fast systems, Technology development, MOSFET based design.

7. Introduction to Embedded Systems

   Embedded Systems, Processor Embedded into a System, Embedded Hardware Units and Devices in a System, Embedded Software in a System, Examples of Embedded Systems, Embedded Systems on Chip, Complex Systems Design and Processors, Design Process in Embedded System, Formalization of System Design, Design Process and Design Examples, Classification of Embedded Systems, Skills required for an Embedded System Designer.

8. Embedded Software Development Process and Tools
   Introduction to Embedded Software Development Process and Tools, Host and Target Machines, Linking and Locating Software, Getting Embedded Software into the Target System, Issues in Hardware-Software Design and Co-design

Text books:

1. Basic VLSI Design by Douglas A, Pucknell, Kamran Eshraghian, Prentice-Hall, l996, 3rd Edition.
2. Embedded Systems Architecture, Programming and Design, second edition by Raj Kamal, Tata McGraw Hill Publication (Chapter 1, Chapter 13)

References:

1. Mead, C.A and Conway, LA, "Introduction to VLSI Systems", Addison-Wesley, Reading, Massachusetts, l980.

ECE 4104 MICROWAVE ENGINEERING

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				

3	3	-	-	3	30	70	100

1. Microwave Components:

   Introduction to Microwaves and their applications, Coaxial Line Components, Wave-guide Components, Directional Couplers, Hybrid Tee Junction, Magic Tee, Attenuators, Ferrite Devices, Isolators, Circulators, Cavity Resonators, Re-entrant Cavities, Wave-meters, Microwave Filters, Detectors, Mixers.

2. Microwave Signal Generators and Amplifiers:

   Vacuum Tube Triodes, Resonant Cavity Devices, Reflex Klystron, Two – Cavity Klystron, Multi – Cavity Klystron, Slow – Wave Devices, TWT, Crossed Field Devices, Magnetrons, Semiconductor Devices, Microwave BJTs, FETs, Tunnel Diodes, Gunn Diode, IMPATT, TRAPATT Diodes.

3. Microwave Circuits:

   Scattering Matrix and its Properties, Scattering Matrix of directional coupler, circulator, E Plane Tee, H plane Tee and Magic Tee.

4. Microwave Integrated Circuits:

   Materials, Substrate, Conductor, Dielectric and Resistive Materials, MMIC Growth, Fabrication Techniques, MOSFET Fabrication, NMOS Growth and CMOS Development, Thin Film Formation.

5. Microwave Measurements:

   VSWR, Frequency, Guide Wavelength, Coupling and Directivity measurements.

Text Books:

1. Microwave Engineering, G.S.N. Raju, IK International Publishers,
2. Microwave Communications – Components and Circuits, E. Hund, McGraw Hill.
3. Microwave Devices and Circuits, S. Y. Liao, PHI.
4. Microwave Engineering, R. Chatarjee, East – West Press Pvt. Ltd.

References:

1. Foundations For Microwave Engineering, R. R. Collin, McGraw Hill.

ECE 4105 RADAR ENGINEERING

Credits	**Periods**			**Exam Hrs.**	**Sessional Marks**	**Exam Marks**	**Total Marks**
	Theory	**Tutorial**	**Lab**				
3	**3**	**-**	**-**	**3**	**30**	**70**	**100**

1. Radar Equation, Radar Block Diagram and Operation, Prediction of Range, Minimum Detectable Signal, Receiver Noise, Probability Density Functions, S/N, Integration of

Radar Pulses, Radar Cross-section, Transmitter Power, PRF and Range Ambiguities, Radar Antenna Parameters, System Losses and Propagation Effects.

2. MTI and Pulse Doppler Radar: Introduction, Delay line Cancellers, Moving target Detector, Limitation to MTI performance, MTI from moving platform, Pulse Doppler Radar
3. Tracking Radar, Sequential Lobing, Conical Scan, Monopulse tracking Radar, Low angle tracking, Pulse compression,

   Block Diagrams of Synthetic Aperture Radar (SAR), Phased array Radars,. MST Radar, ECM, ECCM
4. Radar Receiver, Mixers, Radar Displays, Receiver Protectors.
5. Principles of Direction Finders, Aircraft Homing and ILS, Radio Altimeter, LORAN, DECCA, OMEGA, Inland Shipping Aids.

Text Book:

Radar Engineering and Fundamentals of Navigational Aids, G S N Raju, IK International Publishers, 2008

References

Introduction to Radar Systems, Skolnik, McGraw Hill, 2007.

ECE 4106Core Elective III FIBER-OPTIC COMMUNICATIONS

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

1. Propagation: in Fibers:

   Elementary discussion of propagation in fibers
   Attenuation in Optical Fibers

   E M wave propagation in step-Index Fibers

   E M wave propagation in graded-Index Fibers.
2. Optical Fibers and Associated Components:

   Fiber Properties
   Splices, connectors, Couplers, and Gratings.
3. Transmitting and Receiving Devices:

   Injection laser Characteristics
   LED structures, Characteristics and modulation

4. Optical Transmitters, Receivers and Fiber-optic Link Design:
5. Concepts of Fiber-Optic Networks and wavelength – Division Multiplexing:

Books:

For syllabus items 2,4 and 5

An Introduction to Fiber Optic Systems by John Powers, 2nd Edition, Irwin, l997.

For syllabus item 1

Optical Communication Systems by John Gowar, PHI l994

For syllabus item 3

Optical Fiber Communications, Principles and Practice by John M. Senior, Second Edition, PHI l996.

ECE 4106 Core Elective III DATA COMMUNICATIONS

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

Data Communication Concepts and Terminology:

Data Representation, Data Transmission, Modes of Data Transmission, Signal Encoding, Frequency Spectrum, Transmission Channel, Data Communication

Transmission Media:

Transmission Line Characteristics, Transmission Line Characteristics in Time Domain, Cross talk, Metallic Transmission Media, Optical Fiber Base-band Transmission of Data Signals, Telephone Network, Long Distance Network

Modems and Data Multiplexers:

Digital Modulation Methods, Multilevel Modulation, Differential PSK, Standard Modems, Limited Distance Modems and Line Drivers, Group Band Modems, Data Multiplexers, Statistical Time Division Multiplexers

Error Control:

Transmission Errors, Coding for Error Detection and Correction, Error Detection Methods, Forward Error Correction Methods, Reverse Error Correction

The Physical Layer, The Data Link Layer:

Need for Data Link Control, The Data Link Layer 196, Frame Design Considerations, Flow Control, Data Link Error Control, Data Link Management, HDLC-HIGH-LEVEL DATA LINK CONTROL

The Network Layer:

The Sub network Connections, Circuit Switched Sub networks, Store and Forward Data Sub networks, Routing of Data Packets, Internetworking, Purpose of the Network Layer, Title of X.25 Interface, Location of X.25 Interface, Addressing in X.25, Packet Assembler and Disassembler (PAD), Asynchronous Character Mode Terminal PAD

Local Area Networks:

LAN Topologies, Media Access Control and Routing, MIEDIA ACCESS CONTROL IN LOCAL AREA NETWORKS, INTERNETWORKING, THE TRANSPORT AND UPPER OSI Layer, The Session Layer, The Presentation Layer, The Application Layer.

Text Book:

Praksh C. Gupta 'DATA COMMUNICATIONS' Prentice Hall of India 1996.

ECE 4106 BIO MEDICAL SIGNAL PROCESSING

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

Introduction: Biomedical signal Processing : Basics of Bioelectrical signals, signal Acquisition and analysis,Performance Evaluation.

Examples of Biomedical signals: The Electroencephalogram, The Electromyogram, The Electrocardiogram,The Electroneurogram, The Electrogastrogram, Event-related potentials (ERPs). Objectives of Biomedical signal analysis, Difficulties in Biomedical signal analysis, Computer-aided Diagnosis.

The Electroencephalogram (EEG): The Electroencephalogram (EEG) – A brief background, The Nervous system, The EEG-electrical Activity measured on the scalp, Recording techniques, EEG applications.

EEG Signal Processing: Modeling the EEG signal, Artifacts in the EEG, Nonparametric Spectral Analysis, Model-based Spectral Analysis, EEG Segmentation, Joint Time-Frequency analysis.

The Electromyogram: The Electrical Activity of Muscles, Amplitude Estimation in the surface EMG, Spectral analysis of the Surface EMG, Conduction Velocity Estimation, Modeling the Intramuscular EMG, Intramuscular EMG Signal Decomposition.

The Electrocardiogram: The Electrocardiogram – A Brief Background : Electrical Activity of the Heart, Generation and Recording of an ECG, Heart Rythms, Heartbeat Morphologies, Noise and Artifacts, Clinical Applications.

ECG Signal Processing: Baseline Wander, Power line interference (50/60 Hz), Muscle Noise Filtering, QRS detection, Wave delineation, Data Compression

ECG Signal Processing: Heart Rate Variability: Acquisition and RR interval condition, Time domain measures, Heart Rhythm representations, Spectral Analysis of Heart rate variability, Clustering of Beat Morphologies, Dealing with Ectopic Beats, Interaction with other Physiological signals.

TEXT BOOKS:

1. Leif Sornmo and Pablo Laguna, **"**Bioelectrical Signal Processing in Cardiac and Neurological Applications**"** Elsevier Academic Press. 2005.

2. Rangaraj M. Rangayan, **"**Biomedical Signal Analysis- A case study approach**"** IEEE Press series on Biomedical Engineering, 2002.

REFERENCE BOOKS:

1. Bruce, **"**Biomedical Signal Processing & Signal Modeling,**"** Wiley, 2001

2. D.C.Reddy, **"**Biomedical Signal Processing: Principles and Techniques**"**, 2nd edition, Tata McGraw-Hill, New Delhi, 2005.

ECE 4106 EMBEDDED SYSTEMS

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

Syllabus:

1. Introduction to Embedded Systems: Examples, Typical Hardware,Memory,Microprocessors , Busses; Introduction to 8051 Microcontroller , Architecture,Instruction set, Programming. Interrupts: Interrupt Basics, Shared-Data problem,Interrupt Latency.

2. Software Architectures: Round-Robin Architecture, Round-Robin with InterruptsArchitecture, Function-Queue Scheduling Architecture, Real-Time Operating SystemsArchitecture, Selection of Architecture.

3. Real Time Operating System: Tasks and Task States, Tasks and Data, Semaphoresand Shared Data, Semaphore Problems, Semaphore variants.Inter Task Communication: Message Queues, Mailboxes, Pipes, Timer Functions,Events, Memory Management, Interrupt Routines in RTOS Environment.

4.Design issuesof RTOS: Principles , Encapsulation Semaphores and Queues, HardReal-Time Scheduling Considerations, Saving Memory Space, Saving Power.

5. Embedded Software development Tools: Host and Target Machines , Linker/Locatorfor Embedded Software, Getting Embedded Software into the Target System.Embedded Software Debugging Techniques :Testing on your Host Machine,Instruction Set Simulators, Laboratory Tools used for Debugging.

6.Introduction to the Internet of Things:History of IoT, IoT Architecture,M2M –Machine to Machine, Web of Things, IoT protocols, The Layering concepts, IoT Communication Pattern, IoT protocol Architecture.
88

Text Books:1. The 8051 Microcontroller Architecture, Programming & Applications, Kenneth J.Ayala, Penram International.

2. An Embedded Software Primer, David E. Simon, Pearson Education , 2005.3. Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems,Marina Ruggieri & Homayoun Nikookar, River Publishers Series in Communications.

Reference Book:1. Embedded Systems: Architecture , Programming and Design, Raj Kamal, Tata McGraw-HillEducation, 2008

ECE 4106 Core Elective III TV AND SATELLITE COMMUNICATION

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

Television

Basic Television System:

Sound and Picture Transmission, the Scanning Process, Interlaced Scanning, Number of Scanning Lines, Vertical and Horizontal Resolution, Bandwidth of the Baseband Picture Signal.

Television Cameras:

Principle of working and constructional details of Image Orthicon, Vidicon, Plumbicon and Silicon diode array Vidicon and Solidstate Image Scanners.

Composite - Video Signal:

Video signal levels, Need for Synchronization, Details of Horizontal and Vertical Sync Pulses, Equalizing Pulses.

Signal Transmission and Channel Bandwidth:

AM and FM Channel Bandwidth, VSB Transmission, Complete Channel Bandwidth, Reception of Vestigial Sideband Transmission, Television Standards, Block Schematic study of a typical TV Transmitter.

The TV Picture Tube:

Monochrome Picture Tube, Picture Tube Characteristics and Picture Tube Control Circuits, Gamma Correction.

Television Receiver:

Block Schematic and Functional Requirements, VSB Correction, Vertical and Horizontal Deflection Circuits, E.H.T. Generation, Study of Video IF Amplifier Video Detector, Sound Channel Separation, Sync Separation Circuits.

Colour Television:

Principles of Additive and Subtractive Colour Mixing, Chromaticity Diagram, Compatibility and Reverse Compatibility of Colour and Monochrome TV Requirements, Colour Signal Transmission, Bandwidth for Colour Signal Transmission, Sub-carrier Modulation of Chroma Signals, NTSC Encoding (Y, I, Q signals), PAL Encoding (Y, U, V signals), NTSC and PAL Decoders, Types of Colour TV Picture Tubes (Delta-gun, PIL and Trinitron Picture Tubes), Convergence Techniques.

Satellite Communication

Orbital Aspects, Tracking and Control of Communication Satellites, Launch Vehicles, Propagation Characteristics: Attenuation and Noise, Frequency Bands, Satellite Transponders, Earth Station: Configuration, High Power Amplifiers, Antennas, LNA, Link Design, Multiple Access: FDMA, TDMA, CDMA, SPADE, INTELSATs, INSAT.

Text Books:

1. Global Navigation Satellite Systems with Essentials of Satellite Communications authored by G S Rao, Mc-Graw Hill Publication, New Delhi 2010
2. Monochrome and Colour Television, R. R. Gulati, Wiley Eastern.

References:

1. Television Engineering, A. M. Dhake, Tata - McGraw Hill.
2. Satellite Communication, D. C. Agarwal, Khanna Publishers.
3. Satellite Communication, T. Pratt and S. W. Bostian, John Wiley and Sons.

ECE 4107 Core Elective- IV (1)GLOBAL POSITIONING SYSTEM

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

Introduction to Global Position System, the History of GPS, the Evolution of GPS, Development of NAVSTAR GPS, Block I,Block II satellites, Block IIA, Block IIR and Block II R-M satellites.

GPS working principle, Trilateration, Determination of where the satellites are,Determination of how far the satellites are, Determining the receiver position in 2D or X-YPlane, Determining the receiver position in 3D or X-Y-Z Plane, basic equations for finding user position, user position determination with least squares estimator.

Other Global Satellite Constellations, GLONASS, GALILEO, Comparison of 3GNSS (GPS, GALILEO, GLONASS) interms of constellation and services provided.

GPS Satellite constellation and Signals, GPS system segments, Space segment, Control segment, User segment, GPS Signals,Pseudorandom noise (PRN) code, C/A code , P code Navigation data, Signal structure ofGPS.

Coordinate Systems: Geoid, Ellipsoid, Coordinate Systems, Geodetic and Geo centric coordinate systems,ECEF coordinates, world geodetic 1984 system, Conversion between Cartesianand geodetic coordinate frame.

Textbook:

1. G S RAO, Global Navigation Satellite Systems, McGraw-Hill Publications, New Delhi, 2010

2. Pratap Mishra, Global positioning system: signals, measurements, and performance, Ganga-Jamuna Press, 2006

Referrences:

1. Scott Gleason and DemozGebre-Egziabher, GNSS Applications and Methods, Artech House, 685 Canton Street, Norwood, MA 02062, 2009.
2. James Ba – Yen Tsui, ‘Fundamentals of GPS receivers – A software approach’,John Wiley & Sons (2001).
3. B.Hoffmann-Wellenhof, GPS theory and practice, 5th Edition, Springer 2001.

ECE 4107 TELECOMMUNICATION SWITCHING SYSTEMS

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

1. Telecommunication Switching Systems : Basics of Switching Systems, Manual SwitchingSystems, Principles of Cross Bar Switching. **Electronic Space Division Switching:** Stored Program Control, Centralized SPC, Distributed SPC, Two Stage Networks, Three Stage Networks, N Stage Networks

2 Time Division Switching: Basic Time Division Space Switching**,** Basic Time Division TimeSwitching, Time Multiplexed Space Switching, Time Multiplexed Time Switching, Combination Switching, Three Stage Combination Switching, N-Stage Combination Switching

3 Telephone Networks : Subscriber Loop Systems, Switching Hierarchy and Routing,Transmission Plan, Numbering Plan, Charging Plans. Signaling Techniques : In Channel Signaling, Common Channel Signaling.

4 Traffic Engineering : Network Traffic Load And Parameters, Grade Of Service, BlockingProbability, Modeling Switching Systems, Incoming Traffic and Service Time Characterization, Blocking Models and Loss Estimates, Delay Systems

5 Integrated Services Digital Network (ISDN) : Motivation For ISDN, Network & ProtocolArchitecture, Transmission Channels, User Network Interfaces, Signaling, Numbering, Addressing, ISDN Standards, Broadband ISDN.

6 **Data Networks :** Data transmission in PSTNs, Switching techniques for data transmission,Data communication architecture, Link-to-link layers, End-to-End layers, Local Area Networks, Metropolitan Area Networks, Data Network Standards, Protocol Stacks, Internetworking.

Text Book:

1. ThyagarajanViswanath, **"**Telecommunication Switching Systems and Networks**"** PHI, 2000. (UNIT I, II, III & IV).

Reference Books :

1. J. Bellamy, **"**Digital telephony**"**,2nd edition, 2001,John Wiley.

2. B.A. Forouzan, **"**Data Communication & Networking**"**, 3rd Edition,2004, TMH.

3. J E Flood, **"**Telecommunication switching, Traffic and Networks**"**, 2002, Pearson Education.

ECE 4107 SMART ANTENNA SYSTEMS

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

Unit I:Introduction To Smart Antennas

Need for Smart Antennas, Smart Antenna Configurations, Switched-Beam Antennas, Adaptive Antenna Approach, Space Division Multiple Accesses (SDMA), Architecture of a Smart Antenna System, Receiver, Transmitter, Benefits and Drawbacks, Mutual Coupling Effects

Unit II:DOA Estimation Fundamentals

Introduction The Array Response Vector, Received Signal Model, The Subspace-Based Data Model, Signal Auto covariance Matrices ,Conventional DOA Estimation Methods, Conventional Beamforming Method, Capon's Minimum Variance Method, Subspace Approach to DOA Estimation ,The MUSIC Algorithm, The ESPRIT Algorithm, Uniqueness of DOA Estimates

Unit III: Beam forming Fundamentals

The Classical Beam former-Statistically Optimum Beam forming Weight Vectors, The Maximum SNR Beam former, The Multiple Side lobe Canceller and the Maximum, SINR Beam former- Minimum Mean Square Error (MMSE),Direct Matrix Inversion (DMI), Linearly Constrained Minimum Variance (LCMV) , Adaptive Algorithms for Beam forming ,The Least Mean-Square (LMS) Algorithm, The Recursive Least-Squares (RLS) Algorithm

Unit IV:Space–Time Processing

Introduction, Discrete Space–Time Channel and Signal Models, Space–Time Beamforming, Inter symbol and Co-Channel Suppression, ISI Suppression, CCI Suppression, Joint ISI and CCI Suppression, Space–Time Processing for DS-CDMA, Capacity and Data Rates in MIMO Systems, Single-User Data Rate Limits, Multiple-Users Data Rate Limits, Data Rate Limits Within a Cellular System, MIMO in Wireless Local Area Networks

Unit V:Mobile Stations' Smart Antennas-

Introduction -Multiple-Antenna MS Design, Combining Techniques, Selection (Switched) Diversity, Maximal Ratio Combining, Adaptive Beamforming or Optimum Combining ,RAKE Receiver Size, Mutual Coupling Effects, Dual-Antenna Performance Improvements ,Downlink Capacity Gains

Text Books:

1. Constantine A. Balanis, Panayiotis I. Ioannides, Introduction to Smart Antennas Morgan & Claypool Publishers

2. Ahmed El Zooghby, Smart Antenna Engineering, Artech House

Reference Book:

1. M.J. Bronzel, Smart Antennas, John Wiley, 2004
2. T.S.Rappaport&J.C.Liberti, Smart Antennas for Wireless Communication, Prentice Hall (PTR) , 1999.
3. R.Janaswamy, Radio Wave Propagation and Smart Antennas for Wireless Communication, Kluwer, 2001

ECE 4107 RADAR SIGNAL PROCESSING

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

Introduction

Basic radar functions, elements of pulsed radar, review of selected signal processing concepts, preview of basic radar signal processing.

Signal Models

Components of a radar signal, amplitude models, simple point target radar range equation, distributed target forms of range equation, radar cross section (RCS), radar cross section for meteorological targets, statistical descriptions of RCS, Clutter, behavior of sigma_0, signal to clutter ratio, temporal and spatial correlation of clutter, compound models of RCS, noise model and Signal to Noise Ratio, jamming, frequency models: the Doppler shift, simplified approach to Doppler shift, the stop and hop assumption and spatial Doppler.

Sampling and Quantization of Pulsed Radar Signals

Domains and Criteria for sampling radar signals, time and frequency samples, spatial samples sampling criteria, Sampling in the fast time dimension sampling in slow time, Sampling the Doppler spectrum, the Nyquist rate in Doppler, Straddle Loss, sampling in the spatial and angle domains, Phased array element spacing, Antenna beam spacing, Quantization.

Radar Waveforms

Introduction, the waveform matched filter, the matched filter, matched filter for the simple pulse, all range matched filtering, range resolution of the matched filter, matched filtering of moving targets, the ambiguity function, definition and properties of the ambiguity function, ambiguity function of the simple pulse, the pulse burst waveform, matched filter for the pulse burst waveform, pulse by pulse processing, range ambiguity, Doppler response of the pulse burst waveform, ambiguity function for the pulse burst waveform, relation of the slow time spectrum to the ambiguity function, Frequency modulated (FM) pulse compression waveform, linear frequency modulation (LFM), the principle of stationary phase, ambiguity function of the LFM waveform, range-Doppler coupling.

Doppler Processing

Moving platform effects on the Doppler spectrum, moving target indication (MTI), pulse cancellers, vector formulation of the matched filter, matched filter for clutter suppression, blind speeds and staggered pulse repetition frequencies (PRFs), MTI figures of merit, limitations of MTI, pulse Doppler processing, the discrete time Fourier transform of a moving target, sampling the DTFT: the discrete Fourier transform, matched filter and filter-bank interpretations of pulsed Doppler processing with the DFT, fine Doppler estimation, modern spectral estimation in pulse Doppler processing.

TEXT BOOK

1. Mark Richards, Fundamentals of radar signal processing, McGraw-Hill education, 2005, 539pp.

REFERENCE BOOK

1. Bassem R. Mahafza, Radar signal analysis and processing using Matlab, Chapman and Hall/CRC, 2008, 504pp.

ECE 4107: ARTIFICIAL NEURAL NETWORKS

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
3	3	-	-	3	30	70	100

1. Artificial Intelligence as Representation and Search

Introduction to AI, Roots and Scope of AI, Definition, Turing Test, Application Areas of AI, Predicate Calculus, Structures and Strategies for State Space Search , Heuristic Search , Control and Implementation of State Space Search

2 Representation and Inference

Knowledge Representation , Strong Methods for Problem Solving , Reasoning in Uncertain

3 Situations, Machine Learning

Symbol-Based: Framework for Symbol – Based Learning, Version Space Search, ID3 Algorithm, Un-supervised learning, Reinforcement Learning , Connectionist: Perceptron Learning, Backpropagation Learning, Competitive Learning, Hebbian Coincidence Learning, Attractor Networks

4 Neural Networks and Fuzzy Systems

Neural and Fuzzy machine intelligence, fuzziness as multivalence, the dynamical-systems approach to machine intelligence, intelligent behaviour as adaptive model-free estimation.

5 Neural Dynamics

I. Activations and signals : Neurous as functions, signal monotonicity, biological activations and signals, neuron fields, neuronal dynamical systems, common signal functions, pulse-coded signal functions

Neuronal dynamics II : Activation Models : neuronal dynamical systems, additive neuronal dynamics, additive neuronal feedback, additive bivalent models, BAM Connection matrices, additive dynamic and the noise-saturation dilemma, general neuronal activations : Cohen-grossberg and multiplicative models

6 Synaptic Dynamics

I. Unsupervised Learning : Learning as encoding, change, and quantization, four unsupervised learning laws, probability spaces and random processes, stochastic unsupervised learning and stochastic equilibrium, signal hebbian learning, competitive learning, differential hebbian learning, differential competitive learning. Synaptic Dynamics II : Supervised learning : Supervised function estimation, supervised learning as operant conditioning, supervised learning as stochastic pattern learning with known class memberships, supervised learning as stochastic approximation, the back propagation algorithm.

Text Book:

1. **"**Artificial Intelligence – Structures and Strategies for Complex Problem Solving**"**, George F. Luger, Th 4 Edition, Pearson Education , 2003.
2. Neural Networks & Fuzzy Systems, Bark Kosko, PHI Published in 1994.

Reference Books:

1. Artificial Intelligence, Knight, Tata McGraw Hill
2. Artificial Intelligence 'a Modern Approach, Russell &Norvig, second edition, Pearson Education, 2003.
3. Fundamentals of Artificial Neural Networks, Mohamad H Hassoum, PHI
4. Neural Network Design, Hagan, Demuth and Beale, Vikas Publishing House.

ECE 4108 DIGITAL COMMUNICATION LABORATORY

Credits	Periods			Exam Hrs.	Sessional Marks	Exam Marks	Total Marks
	Theory	Tutorial	Lab				
1.5	-	-	3	3	50	50	100

1. Sample the given input signal for different sampling rates and recover the signal by means of appropriate low – pass filter.

2. Study the Pulse – Width Modulation for both AC and DC Modulating Signals and obtain the corresponding waveforms.

3. Study the Pulse – Position Modulation for both AC and DC Modulating Signals and obtain the corresponding waveforms.

4. Study the functioning of a given Analog to Digital Converter.

5. Study the functioning of a given Digital to Analog Converter.

6. Encode the given 4-Bit Data Word into 16-Bit Orthogonal Encoded Word using Hadamard Code.

7. Decode the 16-Bit Orthogonal Encoded Word to 4-Bit Data Word.

8. Study the performance of the given Continuously Variable Slope Delta Modulation (CVSD).

9. Obtain the characteristics of the Phase Shift Keying (PSK) Modulator.

10. Obtain the characteristics of the Frequency Shift Keying (FSK) Modulator.

ECE 4109 MICROWAVE ENGINEERING LABORATORY

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
2	-	-	3	-	50	50	100

1) Measurement of VSWR
2) V-I Characteristics of GUNN Diode
3) Measurement of Coupling Factor and Directivity of a 4-Port directional coupler
4) Measurement of Microwave frequency
5) Reflex Klystron Characteristics
6) Radiation Pattern of Horn Antenna
7) Fiber Optic Analog Link
8) Fiber Optic Digital Link

Other four experiments from the choice either from Microwave Engineering or from Antenna Theory

ECE 4201 **PROJECT**

Credits	***Periods***			***Exam Hrs.***	***Sessional Marks***	***Viva***	***Total Marks***
	Theory	***Tutorial***	***Lab***				
14	-	-	28	-	50	50	100