Dept. of Electronics & Communications Engineering

Andhra University College of Engineering (A)

Visakhapatnam-530003

4 Years B.TECH

and

B.TECH+M.TECH (DOUBLE DEGREE COURSE)

Scheme of Instruction and Examination witheffect from 2015-2016 admitted batch onwards

Under Choice Based Credit System

ANDHRA UNIVERSITY:: VISAKHAPATNAM

COMMON SCHEME OF INSTRUCTION & EXAMINATION

I/IV B.TECH (FOUR YEAR COURSE) &

I/IV B.TECH (SIX YEAR DOUBLE DEGREE COURSE)

(With effect from **2015-2016** admitted batch onwards)

Under Choice Based Credit System

GROUP – B

(EEE, **ECE**, Mechanical, Marine, Metallurgy, Geo-Informatics, Instrumentation Technology**)**

I-SEMESTER

Code No.	***Course***	***Credits***	***Lecture Hrs***	***Tutorial Hrs***	***Lab Hrs***	***Total Contact Hrs/Week***	***Sessional Marks***	***Exam Marks***	***Total Marks***
ENG 1101	English	4	3	1	--	4	30	70	100
ENG 1102	Mathematics-I	4	3	1	--	4	30	70	100
ENG 1103	Mathematics-II	4	3	1	--	4	30	70	100
ENG 1105	Physics	4	3	1	--	4	30	70	100
ENG 1107	Engineering Graphics	4	2	--	3	5	30	70	100
ENG 1109	Professional Ethics & Moral Values	2	2	--	--	2	30	70	100
ENG 1111	Physics Lab	2	--	--	3	3	50	50	100
ENG 1113	Workshop	2	--	--	3	3	50	50	100
ENG 1114	NCC/NSS Sports(Audit)	2	--	--	--	3	--	--	--
	TOTAL	**28**	**16**	**4**	**9**	**32**			

I/IV B.TECH (FOUR YEAR COURSE) &

I/IV B.TECH (SIX YEAR DOUBLE DEGREE COURSE)

(With effect from **2015-2016** admitted batch onwards)

Under Choice Based Credit System

GROUP – B

(EEE, **ECE**, Mechanical, Marine, Metallurgy, Geo-Informatics, Instrumentation Technology)

II-SEMESTER

Code No.	***Course***	***Credits***	***Lecture Hrs***	***Tutorial Hrs***	***Lab Hrs***	***Total Contact Hrs/Week***	***Sessional Marks***	***Exam Marks***	***Total Marks***
ENG 1201	Mathematics-III	4	3	1	--	4	30	70	100
ENG 1203	Chemistry	4	3	1	--	4	30	70	100
ENG 1205	Computer Programming and Numerical Methods	4	3	1	--	4	30	70	100
ENG 1207	History of Sciences & Technology	2	2	--	--	2	30	70	100
ENG 1208	Basic Electronics Engineering	4	3	1	--	4	30	70	100
ENG 1210	Chemistry Lab	2	--	--	3	3	50	50	100
ENG 1212	Computer Programming and Numerical Methods Lab	2	--	--	3	3	50	50	100
ENG 1213	English Language Lab	2	--	--	3	3	50	50	100
ENG 1214	Sports/NCC/NSS (Audit)	2	--	--	--	3	--	--	--
	Total	**26**	**14**	**4**	**9**	**30**			

II/IV B.TECH (FOUR YEAR COURSE) &

II/IV B.TECH (SIX YEAR DOUBLE DEGREE COURSE)

2ND YEAR I-SEMESTER, ECE

(SCHEME OF INSTRUCTION AND EXAMINATION WITH EFFECT FROM 2015-2016, CBCS)

Code No.	*Subject*	*Credits*	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
			Theory	*Tutorial*	*Lab*				
EEM 2101	Mathematics IV	4	3	1	-	3	30	70	100
EEE 2102	Network theory Analysis	4	3	1	-	3	30	70	100
EEE 2103	Electrical Machines	4	3	1	-	3	30	70	100
ECE 2104	Electronic Devices and Circuits	4	3	1	-	3	30	70	100
ECE 2105	Switching Theory and Logic Design	4	3	1	-	3	30	70	100
ECS 2106	Data Structures	4	3	1	-	3	30	70	100
ECE 2107	Network and Machines Lab	2	-	-	3	3	50	50	100
ECE 2108	Electronic Devices & Circuits Lab	2	-	-	3	3	50	50	100
	Total	28	18	6	6		280	520	800

II/IV B.TECH (FOUR YEAR COURSE) &

II/IV B.TECH (SIX YEAR DOUBLE DEGREE COURSE)

2ND YEAR II-SEMESTER, ECE

(SCHEME OF INSTRUCTION AND EXAMINATION WITH EFFECT FROM 2015-2016, CBCS)

Code No.	*Subject*	*Credits*	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
			Theory	*Tutorial*	*Lab*				
EEM 2201	Mathematics V	4	3	1	-	3	30	70	100
ECE 2202	Electromagnetic Field Theory & Transmission Lines	4	3	1	-	3	30	70	100
ECE 2203	Analog Electronic Circuits	4	3	1	-	3	30	70	100
ECE 2204	Pulse and Digital Circuits	4	3	1	-	3	30	70	100
ECE 2205	Probability Theory and Random Processes	4	3	1	-	3	30	70	100
ECE 2206	Signals & Systems	4	3	1	-	3	30	70	100
ECE 2207	Environmental Studies	3	3	-	-	3	30	70	100
ECE 2208	Digital IC's and HDL Lab	2	-	-	3	3	50	50	100
ECE 2209	Analog Electronic & Circuits Lab with Simulation	2	-	-	3	3	50	50	100
	Total	31	21	6	6	-	310	590	900

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

III/IV B.TECH (SIX YEAR DOUBLE DEGREE COURSE)

3RD YEAR I-SEMESTER, ECE

(SCHEME OF INSTRUCTION AND EXAMINATION WITH EFFECT FROM 2015-2016, CBCS)

Code No.	*Subject*	*Credits*	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
			Theory	*Tutorial*	*Lab*				
ECE 3101	Linear ICs & Applications	4	3	1	-	3	30	70	100
ECE 3102	Communication Systems	4	3	1	-	3	30	70	100
ECE 3103	Core Elective 1	4	3	1	-	3	30	70	100
ECE 3104	Antennas &Wave Propogation	4	3	1	-	3	30	70	100
EEE 3105	Control Systems	4	3	1	-	3	30	70	100
ECE 3106	Digital Signal Processing	4	3	1	-	3	30	70	100
ECE 3107	MOOCS- I	2	-	-	-	-	-	-	-
ECE 3108	MOOCS- II (Un-audit)	-	-	-	-	-	-	-	-
ECE 3109	Linear ICs & Pulse Circuit Lab	2	-	-	3	3	50	50	100
ECE 3110	Communication systems Lab	2	-	-	3	3	50	50	100
ECE 3111	Soft Skills	2	3	-	-	-	50	50	100
	Total	32	21	6	6		330	570	900

Core Elective - I

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

MOOCS -I

MOOCS –II (Un-audit)

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

III/IV B.TECH (SIX YEAR DOUBLE DEGREE COURSE)

3RD YEAR II-SEMESTER, ECE

(SCHEME OF INSTRUCTION AND EXAMINATION WITH EFFECT FROM 2015-2016, CBCS)

Code No.	*Subject*	*Credits*	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
			Theory	*Tutorial*	*Lab*				
ECE 3201	Computer Network Engineering	4	3	1	-	3	30	70	100
ECE 3202	Micro Processor & Micro Controllers	4	3	1	-	3	30	70	100
ECE 3203	Digital Communications	4	3	1	-	3	30	70	100
ECE 3204	Core Elective- II	4	3	1	-	3	30	70	100
ECE 3205	Cellular and Mobile Communication	4	3	1	-	3	30	70	100
ECE 3206	Digital Image Processing	4	3	1	-	3	30	70	100
ECE 3207	MOOCS- III	2	-	-	-	-	-	-	-
ECE 3208	DSP with MAT Lab	2	-	-	3	3	50	50	100
ECE 3209	Microprocessor & Micro Controllers Lab	2	-	-	3	3	50	50	100
	Total	30	18	6	6	-	280	520	800

Core Elective- II

1. Wireless Sensor Networks
2. Micro Electronics
3. ASIC Design
4. DSP Processors & Architectures
5. Electronic Measurements and Instrumentation
6. EMI/EMC

MOOCS-III

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

IV/IV B.TECH (SIX YEAR DOUBLE DEGREE COURSE)

4TH YEAR I-SEMESTER, ECE

(SCHEME OF INSTRUCTION AND EXAMINATIONWITH EFFECT FROM 2015-2016, CBCS)

Code No.	*Subject*	*Credits*	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
			Theory	*Tutorial*	*Lab*				
EHM 4101	Principles of Economics & Management	4	3	1	-	3	30	70	100
ECE 4102	Radar Engineering	4	3	1	-	3	30	70	100
ECE 4103	Core Elective III	4	3	1	-	3	30	70	100
ECE 4104	VLSI Design	4	3	1	-	3	30	70	100
ECE 4105	Microwave Engineering	4	3	1	-	3	30	70	100
ECE 4106	Core Elective IV	4	3	1	-	3	30	70	100
ECE 4107	MOOCS- IV	2	-	-	-	-	-	-	-
ECE 4108	Micro Wave Engg. Lab	2	-	-	3	3	50	50	100
ECE 4109	Digital Communication Lab	2	-	-	3	3	50	50	100
	Total	30	18	6	6		280	520	800

Core Elective - III

1. Fiber Optic Communications
2. Digital System Design through Verilog HDL
3. Bio Medical Signal Processing
4. Stealth Technologies
5. TV and Satellite Communication

Core Elective- IV **MOOCS-IV**

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

(OR)

Code No.	*Subject*	*Credits*	Marks	
			Sessionals	Viva
ECE 4100	Project/ Thesis work	Full Semester 15	50	50

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

IV/IV B.TECH (SIX YEAR DOUBLE DEGREE COURSE)

4TH YEAR II-SEMESTER, ECE

(SCHEME OF INSTRUCTION AND EXAMINATIONWITH EFFECT FROM 2015-2016, CBCS)

Code No.	*Subject*	*Credits*	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
			Theory	*Tutorial*	*Lab*				
EHM 4201	Principles of Economics & Management	4	3	1	-	3	30	70	100
ECE 4202	Radar Engineering	4	3	1	-	3	30	70	100
ECE 4203	Core Elective III	4	3	1	-	3	30	70	100
ECE 4204	VLSI Design	4	3	1	-	3	30	70	100
ECE 4205	Micro Wave Engineering	4	3	1	-	3	30	70	100
ECE 4206	Core Elective IV	4	3	1	-	3	30	70	100
ECE 4207	MOOCS- IV	2	-	-	-	-	-	-	-
ECE 4208	Micro Wave Engg. Lab	2	-	-	3	3	50	50	100
ECE 4209	Digital Communication Lab	2	-	-	3	3	50	50	100
	Total	30	18	6	6		280	520	800

Core Elective - III

1. Fiber Optic Communications
2. Digital System Design through Verilog HDL
3. Bio Medical Signal Processing
4. Stealth Technologies
5. TV and Satellite Communication

Core Elective- IV **MOOCS-IV**

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

(OR)

Code No.	*Subject*	*Credits*	Marks	
			Sessionals	Viva
ECE 4200	Project/ Thesis work	Full Semester 15	50	50

EEM 2101 Mathematics IV

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	3	30	70	100

OBJECTIVES:

In general, the students are introduced with a knowledge on - Vector Calculus, Partial differential equations, their applications and Integral Transforms(Fourier transforms, FST,FCT) to facilitate them to use these concepts in their core subjects.

The objectives, in particular are to learn:

- the basic knowledge and applications of Vector Calculus used in Engineering problems.
- about the gradient, divergence and curl under the differentiation of scalar and vector point functions, also on Line-, Surface- and Volume integrals under the integration of point functions; their applications in Engineering problems.
- the transformation theorems such as **Green's** theorem in the plane, **Stoke's** theorem, **Gauss Divergence** theorem and their applications
- how to formulate the Partial Differential Equations from the relations between the dependent and independent variables, and understand the methods of solving first order first order first degree linear, non-linear **Partial Differential Equations**, Homogeneous and Non homogeneous linear partial differential equations with constant coefficients.
- the procedure to find out the solutions of Partial Differential Equations by using the method of separation of variables(product method)
- about the formulation of one dimensional wave (string equation), one -and two-dimensional **Heat flow equations**, **Laplace's equation** in Cartesian and polar coordinates; also to solve these equations by the method of separation of variables.
- on the concept of integral transforms, namely, **Fourier transforms**, **Fourier Sine**, **Cosine** and **related inverse transforms**; their applications in solving several Physical and Engineering problems

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 $\nabla f, \nabla.\overline{F}, \nabla \times \overline{F}, \nabla$ applied twice to point functions, ∇ applied to products of two functions; Irrotational and Solenoidal fields.

UNIT II 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 Unit-III: INTRODUCTION OF PARTIAL DIFFERENTIAL EQUATIONS

Formation of partial differential equations, solutions of partial differential equarions- equations solvable by direct 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 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 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:

Scope and treatment as in "Higher Engineering Mathematics", by Dr. B.S.Grewal, 43rd 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 Kanti B.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.

OUTCOMES: After going through this course, the students would be able to:

- operate the differential operator 'del' to the scalar and vector point functions, Calculate the Gradient, Divergence and Curl, Vector normal to a surface, maximum rate of change of a scalar field, test whether two surfaces are to cut orthogonally or not.
- find the rate per unit volume at which the physical quantity is issuing from a point, the rate of inflow minus out flow using the Divergence and the angular velocity of rotation at any point of the vector field using the Curl.
- **test** whether the given motion is irrotational or rotational, whether a vector force acting on a particle is conservative or not
- find out the potential function from a given vector field.
- obtain the well known Laplace and poisson equations from an irrotational field
- understand to determine the work done by a force field and circulation using a Line integral
- find out the Line, Surface and Volume integrals - find the flux using surface integral and volumes using the volume integral double and triple integrals as these are used to find areas and volumes.
- know the methods of solving Linear and Non linear first order and first degree partial differential equations.
- solve the Linear Partial Differential Equations with constant coefficients (homogeneous and non homogeneous) and know the procedure for finding the complementary function and particular integrals
- apply the method of separation of variables to obtain solutions of most of the boundary value problems involving Linear partial differential equations occurred in engineering studies
- solve, in particular the wave equations, heat equations and Laplace's equations in Cartesian and polar coordinates using the method of separation of variables.
- apply and extend the knowledge of Fourier transform techniques in solving several Initial and Boundary value problems of Engineering, such as in Conduction of heat/Thermodynamics, Hydraulics transverse vibrations of a string, oscillations of an elastic beam, bending of beams, electrical circuits, free and forced vibrations of a membrane and transmission lines, etc.

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EEE 2102 NETWORK THEORY ANALYSIS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	3	30	70	100

UNIT I 1. 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 2. 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 3. 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 4. 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 5. 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, 5th Edition, McGraw Hill International Edition.
2. Network Analysis, M. E. Van Valkenburg, 3rd Edition, PHI.
3. Modern Network Synthesis, M. E. Van Valkenburg, Wiley Eastern.

EEE 2103 ELECTRICAL MACHINES

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	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*				
4	3	1	-	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. Venkat Rao, 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*				
4	3	1	-	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 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, Zui Kohari, TMH

2. Switching theory and logic design by Frederick.J.Hill and Gerald.R.Peterson

3. Switching theory and logic design, Ananda kumar, PHI.

References:

1. Fundamentals of Logic Design, Charles.R.Roth, Thomson Publications.

2. Digital Design by Morries Mono, PHI.

ECS 2106 DATA STRUCTURES (Common with Metallurgy)

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	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.

EEM 2201 Mathematics V

OBJECTIVES:

The student should be able to use the concepts of complex analysis, Sampling theory and Z-transforms. They should know the concepts of analyticity, Complex integration, and complex power series classification of singularities. The student should know the applications of calculus of residues in the evaluation of real definite integrals. The student should be able to use statistical methods to collect and analyze the data. The students should be able to estimate unknown transforms and apply the tests of hypothesis. They should be able to evaluate Z-transforms, inverse Z-transforms and apply these transforms to solve difference equations.

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) $w = \frac{1}{z}$, (iv) Bilinear transformation $w = \frac{az+b}{cz+d}$.

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, x^z -distribution and F-distribution.

TEXT BOOKS:

Scope and treatment as in "higher engineering Mathematics", by Dr.B.S.Grewal, **43rd Edition**, 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 Kanti B.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.

OUTCOME: by the end of the course work, the students will be able to:

1. Use the concepts of complex variable theory, complex integration, singularities and acquire the skill of contour integration to evaluate complicated real definite integrals via residue calculus.
2. Use the concept of sampling theory to collect and analyze the data statistically, describe sampling distributions of sample means and sample proportions and perform hypothesis tests for means.
3. Evaluate Z-transforms and apply inverse Z-transforms to solve difference equations arising in Engineering problem.

ECE 2202 ELECTROMAGNETIC FIELD THEORY & TRANSMISSION LINES

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	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 Density, Convection and Conduction Currents, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations; Capacitance.

Unit -2 Magnetostatics

Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic 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 TE_{10} and TE_{11} 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, Gottapu Sasibhushana Rao, 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 ELECTRONIC CIRCUITS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	3	30	70	100

Unit:1 Small Signal High Frequency Transistor Amplifier models:

BJT: Transistor at high frequencies, Hybrid-π common emitter transistor model, Hybrid-π conductances, Hybrid-π capacitances, validity of Hybrid-π 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.Raja Rajeswari 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 PULSE AND DIGITAL CIRCUITS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	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 ,5th Edn., oxford university press.

References

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

ECE 2206 SIGNALS AND SYSTEMS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	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 Fourier Transform 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, Fourier Transform 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 Z-Transform, 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, 2nd Edn.
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 2nd Edn.
2. Signals and Systems – P.Ramesh Babu and R.Ananda Natarajan 3rd Edn.

ECE 2207 ENVIRONMENTAL STUDIES

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
3	3	-	-	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, Droughts, 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, Transportation, Industrialization, Green revolution, Water scarcity and ground water depletion, Controversies on major dams – Resettlement 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 bachao andolan, Silent valley project, Madhura refinery and Taj Majal, 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 3101 LINEAR ICS AND APPLICATIONS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	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- Ramakanth Gayakwad, PHI, 1987.
2. Linear Integrated Circuits- D.Roy Chowdhury, New Age International(p) Ltd,2nd Edition ,2003.

Reference Books:

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

ECE 3102 ANALOG COMMUNICATIONS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	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 Goutham Sahe, 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 COMPUTER ARCHITECTURE AND ORGANIZATION

(Core Elective-I)

Credits	*Periods*			*Exam Hrs.*	*Sessionals Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	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.Carl Hamacher, Zvonko G.Vranesic and Safwat G.Zaky, McGraw Hill International, 4th Edition.

2. Digital Computer Fundamentals, Thomas C.Bartee.

ECE 3104 ANTENNAS AND WAVE PROPAGATION

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	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, Non-resonant 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.

EEE 3105 CONTROL SYSTEMS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	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 Modeling of Physical Systems – Equations of Electrical Networks – Modeling 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 (5^{th} 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 3106 DIGITAL SIGNAL PROCESSING

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	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:

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 3201 COMPUTER NETWORKS ENGINEERING

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	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 MICRO PROCESSORS AND MICRO CONTROLLERS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	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", Oxford University 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 COMMUNICATION

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	3	30	70	100

1. Pulse 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. 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.
2. 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.
3. 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.
4. Information Theory: Discrete messages, concept of amount of information and its properties, Average information, Entropy and its properties, Information rate, Mutual information and its properties.
5. Source Coding: Introduction, Advantages, Shannon's Theorem, Shannon-Fano coding, Huffman coding, Efficiency calculations, channel capacity of discrete and analog channels, capacity of a Gaussian channel, Binary symmetric channel and Binary erasure channel, Bandwidth- S/N trade off.
6. Linear Block Codes: Introduction, Matrix description of Linear Block codes, Error detection and Error correction capabilities of Linear block code, Hamming codes, Binary cyclic codes, Algebraic structure, encoding, Syndrome calculations, BCH codes.
   Convolution Codes: Introduction, encoding of Convolution Codes, time domain approach, transform domain approach, graphical approach: state, tree and trellis diagram, Viterbi decoding algorithm.

Text Books:

1. Principles of Communication systems, H.Taub and D.L.Schilling and Goutam Saha, 3rd edition TMH publications, 2008 N.Delhi.
2. Digital Communications by Simon Haykins John Wiley, 2005.
3. Channel Coding Techniques for Wireless Communications by K.Deergha Rao, ISBN 978-81-322-2291-0, Springer India 2015.

References:

1. Modern Analog and Digital Communications by B.P.Lathi, Oxford reprint, 3rd Edition, 2004.
2. Digital and Analog Communication systems by Samshanmugam, John Wiley, 2005.
3. Principles of Digital Communications- J.Das, SK.Mullick, P.K.Chatterjee.

ECE 3204 Elective – II (1)WIRELESS SENSORS AND NETWORKS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	*3*	*1*	*-*	*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

ROUTING 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:

S 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 – Jagannathan Sarangapani, CRC Press
3. Holger Karl & Andreas Willig, “Protocols And Architectures for Wireless Sensor Networks", John Wiley, 2005.

REFERENCES:

1. . Kazem Sohraby, Daniel Minoli, & Taieb Znati, “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) MICRO ELECRONICS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	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:

Microelectronic by JocobMilliman, Arbin Grabel second edition, TMH.

Refereces:

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. Micro electronic circuits and devices second edition Horenstien, PHI.

ECE 3204-(3) ASIC DESIGN

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	3	30	70	100

1. Introduction to ASICs – Types of ASICs, Design flow, Economics of ASICs, ASIC cell libraries, CMOS Logic, CMOS design rules, Logic cells, I/O cells, cell compilers.
2. ASIC Library Design – Transistors as resistors, Transistor parasitic capacitance, Logical effort, Cell design, Programmable ASICs, Programmable ASIC logic cells, Programmable ASIC I/O cells, Programmable ASIC interconnect, Programmable ASIC design software.
3. Low-level design entry, Schematic entry, low-level design languages, PLA tools, EDIF, An overview of VHDL and verilog, Logic synthesis, Simulation.
4. ASIC construction, Floor planning and placement.
5. CMOS System Core Studies
   Dynamic Warp Processors : Introduction, The problem, the algorithm, a functional overview, detailed functional specification, structural floor plan, physical design, fabrication, Hierarchical layout and design of single chip 32 bit CPU : Introduction, Design methodology, Technology updatability and layout verification.

6. Practical Realities and Ground Rules
   Further thoughts on floor plans/layout, floor plan layout of the four bit processors, input/output (I/O) pads, “Real estate”, further thoughts on system delays, ground rules for successful design, scaling of MOS circuits.

Textbooks

1. Application Specific Integrated Circuits by J.S. Smith, Addison Wesley, 1997.

Reference Books

1. Basic VLSI Design : Systems and Circuits, Doublas A. Puckness & Kamran Eshraghian, Prentice Hall of India Private Ltd., New Delhi, 1989.
2. Principles of CMOS VLSI Design : A system perspective, N. Westle & K. Eshraghian, Addition – Wesley Pub. Co. 1985.
3. Introduction to VLSI System, C. Mead & L. Canway, Addison Wesley Pub Co. 1990.
4. The Design & Analysis of VLSI Circuits, L.A. Glassey & D.W. Dobbephl, Addison Wesley Pub Co. 1985.
5. Introduction to NMOS & VLSI System Design, A. Mukharjee, Prentice Hall, 1986.
6. VLSI Design Techniques for analog and digital circuits, R.L. Geiger, P.E. Allen & N.R. Streder, McGraw Hill Int. 1990.
7. Digital Integrated Circuits, A Design Perspective, Jan A. Rabey, Prentice Hall of India Pvt. Ltd., 1997.

ECE 3204-(4) DSP PROCESSORS AND ARCHITECTURES

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	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. Venkata Ramani and M.Bhaskar, TMH, 2004.
1. Digital Signal Processing – Jonatham Stein, John Wiley, 2005.

ECE 3204-(5) ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

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 3204(6): EMI / EMC

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	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.

ECE3205 CELLULAR AND MOBILE COMMUNICATIONS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	3	30	70	100

1. Introduction to mobile and cellular communication system:
Introduction, cellular geometry, introduction to cellular concept, principles of operation of a cellular mobile system, multiple access schemes, analog and digital cellular mobile systems.

2. Elements of Cellular Radio System Design:
Introduction, concept of frequency reuse channels, co-channel interference, Desired C/I from normal case in an omni directional antenna system, cell splitting, sectoring, consideration of the components of the cellular system.

3. Interference
Introduction, types of interference, Co-channel interference, Real time Co-channel interference measurement, Diversity Receiver, Non Co-channel interference.

4. Mobile Radio propagation and modelling
Introduction, basics of mobile radio propagation, free space propagation model, link budget design, propagation models, types of small scale fading.
Cell Coverage for Signal and Traffic
Introduction, Point - to - Point model, Propagation over water or flat open area, Foliage loss, Cell site antenna heights and signal coverage cells, Mobile - to - Mobile Propagation.

5. Multiple Access Techniques
Introduction, multiple access techniques, Frequency division multiple access, Time division multiple access, Code division multiple access, space division multiple access, Orthogonal frequency division multiplexing, spectral efficiency of modulation, spectral efficiencies of multiple access techniques, capacity of TDMA and CDMA systems.

6. Handoff Technologies
Introduction, Handoff, classification based on nature of handoff, handoff initiation techniques, dropped calls, dropped call rates.

Text Books:

1. Gottapu Sasibhushana Rao, Mobile Cellular Communication, PEARSON International, 2012.
2. Lee, Cellular and Mobile Communications, Third Edition, McGraw Hill,2006.

Reference Books:

1. Theodore S Rappaport, Wireless Communications: Principles and Practice, Prentice Hall, 2002.
2. Kamilo Feher, Wireless Digital Communication: modulation and spread spectrum applications, PHI, 1995.

ECE3206 DIGITAL IMAGE PROCESSING

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	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 the Fourier 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 color image 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.

EHM 4201/ EHM 4101 PRINCIPLES OF ECONOMICS AND MANAGEMENT

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	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.

Textbooks

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/ECE 4202 RADAR ENGINEERING

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	3	30	70	100

1. Introduction to Radars: Introduction, History, Frequencies and applications of Radars, classification of Radars, Basic Radars, Radar Block Diagram, Pulse Radar characteristics
2. CW Radar, FMCW, Radar, and Pulse Radar:
   Introduction, CW Radar, Doppler Effect, FMCW Radar, FMCW altimeter, Pulse Radar.
3. MTI and Pulse Doppler Radar: Introduction, Doppler Frequency, Doppler processing in CW, MTI and PDRs, MTI radars, Delay line Cancellers, Double Delay Line cancellers, types of MTI radars, Pulse Doppler Radar, Moving target Detector
4. Tracking Radars: Introduction, search and tracking radar system, various scanning and tracking techniques, range tracking, angle tracking, tracking accuracy, frequency agility, Track While Scan, phased array radars, radar displays.
5. Detection of Signals in Noise and Radar Receivers: Introduction, matched filter receiver, correlation detection, detection criteria, automatic detection, CFAR receiver, Detectors, duplexer,

Text Book:

1. Microwave and Radar Engineering, Gottapu Sasibhushana Rao, Pearson Education, New Delhi, 2014.
2. Introduction to Radar Systems, Skolnik, McGraw Hill, 3rd Edition, 2001.

References

1. Simon Kingsley, Shaun Quegan, Understanding Radar Systems, SciTech Publications, 1999.
2. Mark A Richards et.al, Principles of Modern Radar, SciTech Publications,2014.
3. Radar Engineering and Fundamentals of Navigational Aids, G S N Raju, IK International Publishers, 2008

Core Elective-III (1)

ECE4103/ ECE4203-(1) FIBER OPTIC COMMUNICATIONS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	3	30	70	100

1. Optic Fiber Waveguides

   Step – Index Fiber, Graded – Index Fiber, Attenuation, Modes in Step-Index Fibers, Modes in Graded – Index Fibers, Pulse Distortion and Information Rate in Optic Fibers, Construction of Optic Fibers, Optic Fibers, Optic Fiber Cables,

2. Light Sources and Detectors

   Light-Emitting Diodes, Light-Emitting – Diodes Operating Characteristics, Laser Principles, Laser Diodes, Laser-Diode Operating Characteristics, Distributed – Feedback Laser Diode, Optical Amplifiers, Fiber Laser, Vertical-Cavity Surface-Emitting Laser Diodes

3. Principles of Photodetection, Photomultiplier, Semiconductor Photodiode, PIN Photodiode, Avalanche Photodiode,

4. Couplers and Connectors

   Principles, Fiber end Preparation, Splices, Connectors, Source Coupling, Distribution Networks and Fiber Components, Distribution Networks, Directional Couplers, Star Couplers, Switches, Fiber Optical Isolator, Wavelength-Division Multiplexing, Fiber Bragg Gratings, Other Components : Attenuator, Circulator and Polarization Controller

5. Modulation, Noise and Detection

   Light-Emitting-Diode Modulation and Circuits, Laser-Diode Modulation and Circuits, Analog-Modulation Formats, Digital-Modulation Formats, Optic Heterodyne Receivers, Thermal and Shot Noise, Signal-to-Noise Ratio, Error Rates, Modal Noise, Amplifier Noise, Laser Noise, and Jitter, Additional Noise Contributors, receiver Circuit Design

6. System Design and Fiber Optical Applications

   Analog System Design, Digital System Design, Applications of Fiber Optics

Text Book :

1. Fiber Optic Communications, Joseph. C. Palais, Pearson Education, Asia, 2002

Reference :

1. Fiber Optic Systems, John Powers, Irwin Publications, 1997

2. Optical Fiber Communication, Howes M.J., Morgen, D.V John Wiely

ECE 4103/ECE 4203-(2) Digital System Design through Verilog HDL

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	3	30	70	100

1. Introduction to Digital Design Methodology - Glitches and Hazards, Design of sequential machines, state-transition graphs, design example: BCD to Excess-3 code converter, serial - line code converter for data transmission, state reduction, and equivalent states.

2. Algorithmic State Machine Charts for behavioral modeling, ASMD charts, switch debounce, metastability, and synchronizers for asynchronous signals, design example: keypad scanner and encoder.

3. Synthesis of Combinational and Sequential Logic - Introduction to synthesis, synthesis of combinational logic, synthesis of sequential logic with flip-flops, synthesis of explicit state machines, registered logic, state encoding, synthesis of implicit state machines, registers, and counters, synthesis of gated clocks and clock enables

4. Design and Synthesis of Datapath Controllers - Partitioned sequential machines, design example: binary counter, design and synthesis of a RISC stored-program machine, design example: UART

5. Algorithms and Architecture for Digital Processors - Algorithms, nested-loop programs, and data flow graphs, digital filters and signal processors, building blocks for signal processors, asynchronous FIFOs-synchronization across clock domains.

6. Post synthesis Design Tasks - Post synthesis design validation, post synthesis timing verification, estimation of ASIC timing violations, false paths, system tasks for timing verification.

Text Books

1. Michael D. Ciletti (2002), “Advanced digital design with the Verilog HDL”, Eastern economy edition, PHI.

Reference Books:

1. Stephen Brown & Zvonko Vranesic (2007) , ”Fundamentals of Digital logic with Verilog design”, 2nd edition, Tata McGraw Hill,.
2. Ian Grout (2011), “Digital systems design with FPGAs and CPLDs”, Elsevier Publications.
3. Palnitkar, S. (2003). Verilog HDL: a guide to digital design and synthesis (Vol. 1). Prentice Hall Professional.

ECE 4103/ECE 4203-(3) BIO MEDICAL SIGNAL PROCESSING

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	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.
3. Metin Akay, “Biomedical Signal Processing”, First edition, Academic Press Inc,1994.

ECE 4103/ECE 4203-(4) STEALTH TECHNOLOGIES

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	3	30	70	100

Unit 1 : Introduction to Stealth Systems

Introduction, Introduction to low probability of intercept systems, A little history of stealth systems, Basic LPI equations, Introduction to radar cross-section, Introduction to signature balance

Unit 2 : Interceptability Parameters and Analysis

Interceptability parameters, Interceptability analysis, Example mode interceptability, Footprint calculation

Unit 3 : Stealth Waveforms

Waveform criteria, Frequency diversity, Power management, Pulse compression, Discrete phase codes, Hybrid waveforms, Noise propagation in pulse compressors

Unit 4 : Stealth Antennas and Radomes

Introduction, Antenna parameters, Single radiators, Antenna arrays, Electronically scanned arrays, Antenna scattering, Low RCS radomes

Unit 5 : Signal Processing for Stealth

Introduction to stealth signal processing, Air target search, acquisition, track, Terrain following/terrain avoidance, Doppler beam sharpening,

Unit 6: Synthetic aperture radar (SAR) mapping, Ground MTI and MTT

Textbook

1. Introduction to RF Stealth by David Lynch, Jr., Scitech Publishing Inc., 2003., www.scitechpub.com

Core Elective- III(5)

ECE 4103/ECE 4203-(5) TV AND SATELLITE COMMUNICATION

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	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:

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

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 4104/ECE4204 VLSI Design

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	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.

Text books:

1. Basic VLSI Design by Douglas A, Pucknell, Kamran Eshraghian, Prentice-Hall, l996, 3rd Edition.

References:

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

ECE 4105/ ECE 4205 MICROWAVE ENGINEERING

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	3	30	70	100

1. Microwave Components:

   Introduction to Microwave Engineering- microwave spectrum bands, advantages and applications of microwaves, Wave-guide Components, coupling mechanisms, Directional Couplers, Magic Tee, Attenuators, Ferrite Devices, Isolators, Circulators, Cavity Resonators, Re-entrant Cavities,
2. Microwave Tubes:
   Limitations of conventional tubes at microwave frequencies, Resonant Cavities, Linear beam tubes- Reflex Klystron, applegate diagram and principle of working, Two – Cavity Klystron, Multi – Cavity Klystron, Traveling Wave Tube, Crossed Field Device- Magnetron, Hull cut-off voltage Equation.
3. Microwave Solid state Devices
   Negative resistance phenomenon, Gunn Diode, domain formation, RWH theory, Tunnel Diode- principle of operation, IMPATT- principle of operation, TRAPATT, BARITT, PIN Diodes.
4. Scattering Matrices of Microwave Components:
   Scattering Matrix and its Properties, Scattering Matrix of Isolator, circulator, directional coupler, E Plane Tee, H plane Tee and Magic Tee.
5. Microwave Integrated Circuits:
   Introduction, advantages and disadvantages of MMICs, comparison of MMICs with HMICs, Applications of MICs, materials used for MMICs, Substrate, Conductor, Dielectric and Resistive Materials, Growth of MMIC, Fabrication Techniques, MOSFET Fabrication, - MOSFET formation, NMOS fabrication process.
6. Microwave Measurements:

   VSWR, Frequency, Guided Wavelength, Coupling factor and Directivity measurements.

Text Books:

1. Microwave and Radar Engineering, Gottapu Sasibhushana Rao, Pearson Education, New Delhi, 2014.
2. Microwave Engineering, Microwave Engineering, 4th Edition, David M. Pozar, November 2011.

References:

1. Foundations For Microwave Engineering, R. R. Collin, McGraw Hill
2. Microwave Communications – Components and Circuits, E. Hund, McGraw Hill.
3. Microwave Devices, circuts and subsystems for communications engineering, Ian A Glover and Steve Pennock, Wiley Publishers, 2007.
4. Microwave Engineering, G.S.N. Raju, IK International Publishers,

5. **Core Elective- IV (1)**

ECE 4106/ ECE 4206-(1) GLOBAL POSITIONING SYSTEM

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	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-Y Plane, 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 3 GNSS (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 of GPS.

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

Reference Books:

1. Scott Gleason and Demoz Gebre-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 4106/ ECE 4206-(2) TELECOMMUNICATION SWITCHING SYSTEMS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	3	30	70	100

1. Telecommunication Switching Systems : Basics of Switching Systems, Manual Switching Systems, 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 Time Switching, 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, Blocking Probability, 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 & Protocol Architecture, 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. Thyagarajan Viswanath, "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 4106/ ECE 4206-(4) RADAR SIGNAL PROCESSING

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	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 4106/ ECE 4206-(5) ARTIFICIAL NEURAL NETWORKS

Credits	*Periods*			*Exam Hrs.*	*Sessional Marks*	*Exam Marks*	*Total Marks*
	Theory	*Tutorial*	*Lab*				
4	3	1	-	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, 4th 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.