EC 301: ENGINEERING MATHEMATICS

Teaching Scheme			Examination Scheme							
			Theory				Practical			
Lect.	Pract	Total	Int. Assess.	Sem End Marks	Sem End Hrs	Total	Int. Assess.	Sem End	Total	Grand Total
4	0	4	30	70	3	100	--	--	--	100

1. Theory of complex variables:
Analytic functions, Cauchy-Riemann equation, Line integral, Cauchy's theorem and Cauchy's integral. Simple form of conformal transformation with application of the solution of two-dimensional problems.

2. Finite differences and difference equations:
Finite differences interpolation. Newton's and LaGrange's formula. Difference equation with constants co-efficient. Solution of ordinary and partial differential equations with boundary conditions by finite difference method.

3. Numerical methods:
Roots of algebraic equations. Solution of linear simultaneous equations. Numerical differentiation and integration. Numerical methods to solve first order, first degree ordinary differential equations.

4. Laplace transforms:
Definition, Laplace transform of elementary functions. Properties of Laplace transform, Inverse Laplace transforms. Transform derivatives, Transform of integration. Multiplication by t^n, Division by t, Convolution theorem. Unit step and Heaviside's unit function, Dirac-delta function. Periodic functions Solution of ordinary linear differential equations.

5. Fourier series:
Definition of periodic function. Euler's formula. Functions having points of discontinuity. Change of intervals. Odd and even functions. Expansion of odd or even periodic functions. Half range cosine and sine series. Elements of harmonic analysis.

6. Vector Calculus:
Definition of vectors, Scalar and vector point functions – Vector operator del, Del applied to scalar point function – Gradient, Del applied to vector point function – Divergence and Curl, Physical interpretations of divergence and curl, Cylindrical co-ordinate systems and Spherical co-ordinate system.

7. Statistics:
Total probability, Independent events, Theorem of compound probability. Bay's theorem Random variable. Discrete probability distribution. Continuous probability distribution Expectation. Moment generating function. Repeated trials. Binomial Poisson's and normal distribution applications. Calculation of errors. Probable errors. Standard error.

Reference Books:

1. Applied mathematics vol.-I and II. By P.N. WARTIKAR AND J.N.WARTIKAR.
2. Higher engineering mathematics. By B.S.Grewal.
3. Engineering mathematics. By Srivastava.
4. Textbook of engineering mathematics By A.B.Mathur and V.P.Jaggi.

EC 302 – ELECTRONIC DEVICES AND CIRCUITS

Teaching Scheme			Examination Scheme							
			Theory				Practical			
Lect.	Pract	Total	Int. Assess.	Sem End Marks	Sem End Hrs	Total	Int. Assess.	Sem End	Total	Grand Total
4	2	6	30	70	3	100	25	25	50	150

1. Diode theory and diode circuits:
Review of basic semiconductor physics, Drift & Diffusion, Mobility, Conductivity, PN junction diode, Ohmic contacts, Diode volt-ampere characteristics, Temperature dependence of volt-ampere characteristics, Diode resistance, Transition Capacitance and Diffusion Capacitance, Fermilevel, Review of diode rectifiers and diode limiting circuits, Junction diode switching times, Schottkey diode, Zener diode

2. Transistor Characteristics:
Review of transistor operation, current components, Ebers-Moll representation of BJT, Modes of operation, Input and Output characteristics, Transistor as an amplifier, Transistor as a switch, Transistor packages and terminal identification

3. Transistor Biasing Circuits:
DC Operating point, Base bias, Emitter bias, Voltage divider bias, Effect of β_{dc} , stability of operating point, Stability factors, Thermal runaway

4. Transistor small signal amplifiers:
Small signal amplifier operation, ac equivalent circuits, h parameters, common emitter, common collector and common base amplifiers, input resistance, output resistance, current gain, voltage gain, effect of bypass capacitor, stability of voltage gain, cascading of various stages.

5. Amplifier frequency response:
General concepts, low frequency amplifier response, High frequency amplifier response, Gain-Bandwidth product, Distortion in the amplifier

6. Field effect transistor:
The junction field effect transistor, Characteristics of FET, Pinchoff voltage MOSFETs, Enhancement mode and depletion mode MOSFETs, Input characteristics and output characteristics of MOSFET.

7. Integrated Circuit Fabrication:
Monolithic Integrated Technology, Process steps, Photolithography, Masking and etching, Ion implantation, Packaging.

Reference books:

1. Electronic Devices by Floyd
2. Microelectronics by Jacob Millman and Arvin Grabel
3. Microelectronics circuits by Sedra/Smith
4. Art of Electronics by Paul Horowitz
5. Integrated Electronics by Jacob Millman & Helkias
6. Basic Electronics by N.N. Bhargava (TMH)

EC – 303 ELECTRICAL ENGINEERING

Teaching Scheme			Examination Scheme							
			Theory				Practical			
Lect.	Pract	Total	Int. Assess.	Sem End Marks	Sem End Hrs	Total	Int. Assess.	Sem End	Total	Grand Total
4	2	6	30	70	3	100	25	25	50	150

1. **DC Machines:**
   Principle of operation, types, construction, winding, EMF equation, characteristics of dc generators, dc motor operation and types, back EMF, torque, characteristics of motor, speed control of series and shunt motors, dc shunt motor starter.

2. **Transformer:**
   Principle of operation, construction, types, EMF equation, voltage and current transformation ratio, transformer on no load and on load, phasor diagram, equivalent circuit, losses and efficiency, testing.

3. **Induction Motor:**
   Working principle, types, construction, Torque equation, Torque / slip characteristics, power flow, losses and efficiency, starting of induction motor, Single phase induction motor principle, types and construction, stepper motor.

4. **Synchronous Machines:**
   Basic operating principle, construction, EMF equation, winding factor, armature reaction, synchronous impedance and equivalent circuit, synchronous motor operation, phasor diagram, starting, synchronous condenser.

5. **Electrical Power Generation:**
   Layout and equipments used in thermal and hydro power plants, concept of transmission and distribution systems, insulators, earthing of electrical installations, lightening protection.

6. **Switch Gear & Protection:**
   HRC fuses, circuit breaker, types & principle of operation, relaying scheme.

7. **Drives:**
   Factors affecting selection of drives, application of motor for particular drives, techogenerator.

Reference books:

1. Electrical Technology, Volume II by B. L. Theraja.
2. Theory & Performance of Electrical Machines by J. B. Gupta.
3. A course in Electrical Power by Sony, Gupta & Bhatnagar.
4. Electrical Power by S. L. Uppal.
5. Electrical power system by V .K .Mehta.

EC 304 – DIGITAL ELECTRONICS

Teaching Scheme			Examination Scheme							
			Theory				Practical			
Lect.	Pract	Total	Int. Assess.	Sem End		Total	Int. Assess.	Sem End	Total	Grand Total
				Marks	Hrs					
4	2	6	30	70	3	100	25	25	50	150

1. Binary Systems:
Digital Computer & Systems, Binary Numbers, Number Base conversions, Different Number systems & their relations, Complements, Binary codes, Binary storage & registers.

2. Digital Integrated Circuits:
RTL, DTL circuits, I^2L Logic, TTL, ECL, MOS & CMOS circuits & their characteristics, source current & sink current.

3. Boolean Algebra & Logic Gates:
Basic definitions, Axiomatic definition of Boolean Algebra, Basic Theorems & Properties, Boolean functions, Canonical & Standard forms, Logic operations, Digital Logic gates & Logic families.

4. Simplification of Boolean Functions:
Map method,Two,Three,Four,Five & Six variable maps, Products of Sum & Sum of Products
implification, NAND, NOR & Other two level Implementations, Don't care conditions,Tabulation method.

5. Combinational Logic:
Design Procedure, Adders, Subtractors, Code Conversion, Analysis Procedure, Multilevel NAND & NOR circuits, Exclusive-OR & Equivalence functions.

6. Combinational Logic with MSI & LSI:
Binary Parallel Adder, Decimal Adder, Magnitude Comparator, Decoders, Multiplexers, ROMs, PLAs, introduction of PLDs, CPLDs and FPGA..

7. Sequential Logic:
Latch, Flip Flops, difference between latch and flip flop, Triggering of Flip flops, Analysis of clocked sequential circuits, State reduction & assignment, Flip Flop Excitation tables, Design of Sequential circuits, Design of counters, Design using state equations.

8. Registers and Counters:
Registers, Shift registers, Ripple Counters, Synchronous Counters, Memory.

Reference books:
1. Morris Mano, Digital Logic and Computer Design
2. Floyd, Digital Fundamentals
3. Donald D Givone, Digital Principles and Design
4. William Kleitz, Digital Electronics-A Practical Approach
5. R. P. Jain, Digital Electronics
6. Brian Holdsworth, Digital Logic Design

EC 305: NETWORK ANALYSIS

Teaching Scheme			Examination Scheme							
			Theory				Practical			
Lect.	Pract	Total	Int. Assess.	Sem End		Total	Int. Assess.	Sem End	Total	Grand Total
				Marks	Hrs					
4	2	6	30	70	3	100	25	25	50	150

1. Network equation formulation:
Reference direction for current and voltage, active and passive element, dot conversion for coupled circuit, topological description of networks, kirchoff laws, no. of network equation, source transformations, examples of the formulation of network equations, loop variable analysis, node variable analysis, determinates, minor and Guass's method, duality, state variable analysis.

2. Network equations solutions:
Classical method, general and particular solution, time constant, integrating factor, more complicated network, second order equations. With internal and external excitation, initial conditions in networks, higher order equations, network excited by external energy source, response as related to s-plane location of roots, general solutions in terms of s,q, and Wn, laplace transformation, initial and final values of network variables.

3. Transforms of special signal waveforms:
Shifted unit step function, ramp and impulse function and waveform synthesis.

4. Impedance functions and network theorems:
Concept of complex frequency transfer impedance and transform ckts, superposition, reciprocity, thevenin's and norton's theorems, maximum power transfer theorem.

5. Network functions:
Network functions for 1 port and 2 port, ladder network, poles and zeros of network functions, time domain behavior form pole and zero plots.

6. Two port parameters:
Relationship of two port variables, admittance, impedance, transmission and hybrid parameters, relationship between parameter sets, parallel connection of two port networks.

7. Input port parameters:
Sinusoidal steadystate analysis, energy and power, effective or r.m.s. value, average and complex power.

8. Passive Filters:
Classification of filters, filter networks, equation of filter networks, classification of pass band and stop band, characteristics impedance in pass band and stop band, constant k-low pass and high pass filter, band pass filter, band elimination filter

Reference books:

1. Network analysis. By M.E.Van valkenburg.
2. Circuits and Networks: analysis and synthesis By Sudhakar and S. P. Shyammohan
3. Electronic circuits. By Edminister.
4. Network analysis. By G.K.Mithal.

EC-306 SOFTWARE PACKAGE

Teaching Scheme			Examination Scheme							
			Theory				Practical			
Lect.	Pract	Total	Int. Assess.	Sem End		Total	Int. Assess.	Sem End	Total	Grand Total
				Marks	Hrs					
0	2	2	--	--	--	--	25	25	50	50

1. Introduction

2. Basic of MATLAB
MATLAB windows, On-line help, Input-output, File type, General commands.

3. Tutorial Lessons
A minimum MATLAB session, working with Arrays of numbers, creating and Printing simple plots, Creating, saving and executing a script file, Creating and Executing a Function file, working with Files and Directories

4. Interactive Computation
Matrices and Vectors, Matrix and array operations, Saving and Loading Data, Plotting simple graphs

5. Programming in MATLAB: Scripts and Functions
Script files, Function Files, Language-Specific Features, Advance Data Objects

6. Applications
Linear Algebra, Numerical Integration, Ordinary Differential equations

6. Learning MATLAB Simulink
An overview of the Simulink, Quick Start, How Simulink Works, Introduction and applications of Simulink for Electronics & Communication Engineers

Reference books:

1. Rudra Pratap, "Getting started with MATLAB- a quick introduction for Scientists and Engineers", Oxford University Press, 2002.
2. Marc E. Herniter, “Programming in MATLAB”, Brooks/Cole Thomson learning, 2nd edition, 2001.

MATLAB reference manual.