UNIVERSITY OF CALICUT

Faculty of Engineering

Curriculum, Scheme of Examinations and Syllabi for B.Tech Degree Programme with effect from Academic Year 2000-2001

EE : Electrical & Electronics Engineering

THIRD SEMESTER

Code	Subject	Hours/Week			Sessional Marks	University Examination	
		L	T	P/D		Hrs	Marks
EE2K 301	Engineering Mathematics III	3	1	-	50	3	100
EE2K 302	Mechanics of Solids	3	1	-	50	3	100
EE2K 303	Mechanical Engineering I	3	1	-	50	3	100
EE2K 304	Electronics I	3	1	-	50	3	100
EE2K 305	Electric Circuit Theory	3	1	-	50	3	100
EE2K 306	Electrical Measurements & Measuring Instruments	3	1		50	3	100
EE2K 307(P)	**Electronics Lab I**	-	-	3	50	3	100
EE2K 308(P)	**Basic Electrical Engineering Lab**	-	-	3	50	3	100
TOTAL		**18**	**6**	**6**	**400**	**-**	**800**

EE2K 301 : ENGINEERING MATHEMATICS III

(same as AI2K/CH2K/CE2K/EC2K/IC2K/ME2K/PE2K/PM2K/PT2K 301)

3 hours lecture & 1 hour tutorial per week

Module I: Linear algebra I (13 hours)

Vector spaces - subspaces - linear dependence and independence - bases and dimension - linear transformations - sums, products and inverses of linear transformations - linear operator equations

Module II: Linear algebra II (13 hours)

Rank and equivalence of matrices - quadratic forms - characteristic values and characteristic vectors of a matrix - transformation of matrices - functions of a square matrix

Module III: Probability distributions (13 hours)

Random variables - binomial distribution - hypergeometric distribution - Poisson distribution - mean and variance of probability distribution - Chebyshev's theorem - Poisson processes - geometric distribution - continuous random variables - normal distribution - uniform, log-normal, gamma, beta and weibull distributions

Module IV: Statistical inference (13 hours)

Populations and samples - sampling distributions of mean and variance - point estimation - interval estimation - Bayesian estimation - null hypotheses and significance tests - hypothesis concerning one mean - relation between tests and confidence intervals - operating characteristic curves - inferences concerning two means - randomization and pairing - estimation of variances - hypotheses concerning one variance - hypotheses concerning two variances - test of goodness of fit

Text books

1. Wylie C.R. & Barrett L.C., *Advanced Engineering Mat hematics,* McGraw
2. Johnson R.A., *Miller & Freund's Probability & Statistics for Engineers,* Prentice Hall of India

Reference books

1. Hadley G., *Linear Algebra* , Addison Wesley
2. Kreyszig E., *Advanced Engineering Mathematics* , Wiley Eastern
3. Kreider D.L., Kuller R.G., Osterberg & Perkins F.W., *Introduction to Linear Analysis* , Addison Wesley
4. Levin R.I. & Rubin D.S., *Statistics for Management* , Prentice Hall of India
5. Lipschutz S., *Linear Algebra - Schaum's Outline Series* , McGraw Hill
6. Chatfield C., *Statistics for Technolo gy*, Chapman & Hall
7. Walpole R.E. & Meyers, *Probability & Statistics for Engineers & Scientists,* Prentice Hall of India

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

EE2K 302 : MECHANICS OF SOLIDS

(common with CE2K 302)

3 hours lecture & 1 hour tutorial per week

Module I

1. Tension, compression & shear (8 hours)

Types of external loads - self weight - internal stresses - normal and shear stresses - strain - Hooke's law - Poisson's ratio - relationship between elastic constants - stress strain diagrams working stress - elongation of bars of constant and varying sections - statically indeterminate problems in tension and compression - assembly and thermal stresses - strain energy in tension - compression and shear

2. Analysis of stress and strain (5 hours)

Stress on inclined planes for axial and biaxial stress fields - principal stresses - Mohr's circle of stress - principal strains - strain rosette

Module II

3. Bending moment and shearing force (6 hours)

Different types of beams - shear force and bending moment diagrams for simply supported and cantilever beams - relationship connecting intensity of loading - shearing force and bending moment - shear force and bending moment diagrams for statically determinate plane frames

4. Stresses in laterally loaded symmetrical beams (5 hours)

Theory of simple bending - limitations - bending stresses in beams of different cross sections - moment of resistance - beams of uniform strength - beams of two materials - principal stresses in bending - strain energy due to bending - shearing stresses in bending

5. Unsymmetrical bending (2 hours)

Shear flow - shear centre - determination of shear centre for simple sections

Module III

6. Deflection of beams (13 hours)
Differential equation of the elastic curve - Slope and deflection of beams by method of successive integration - Macaulay's method - moment area method - conjugate beam method - deflection due to shear

Module IV
7. Theory of columns (5 hours)
Axial loading of short strut - long columns - Euler's formula - Rankine formula - Secant formula - eccentric loading - direct and bending stresses

8. Torsion (5 hours)
Torsion of circular solid and hollow shafts - power transmission - strain energy in shear and torsion - close coiled and open oiled helical springs

9. Thin and thick cylinders (3 hours)
Lame's equation - stresses in thick cylinders due to internal and external pressures - compound cylinders - shrink fit - wire wound pipes and cylinders

Reference books

1. Timoshenko & Young, *Elements of Strength of Materials* , Affiliated East West Press
2. Popov E.P., *Mechanics of Materials*, Prentice Hall India
3. Hearn E.J., *Mechanics of Materials* Pergamon Press, Oxford University Press
4. Warnock F.V., *Strength of Materials*, Isaac Pitman
5. Nash W.A., *Strength of Materials* , Schaum's Outline Series, McGraw Hill
6. Wang C.K., *Statically Indeterminate Structures* , McGraw Hill.

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EE2K 303 : MECHANICAL ENGINEERING I

(common with PT2K 303)

3 hours lecture & 1 hour tutorial per week

Module I (13 hours)
Thermodynamic systems - thermodynamic properties and processes - heat and work - equations of state - properties of ideal gases - properties of pure substances - PVT, PT, TS, PV diagrams - zeroth law of thermodynamics - first law of thermodynamics - applications of first law to various thermodynamic processes in open and closed systems - internal energy and enthalpy- steady flow energy equations - introduction to second law - entropy - available energy and unavailable energy

Module II (13 hours)
Engineering application of thermodynamics - air cycles - principle of operations of IC engines - two stroke - four stroke - SI and CI engines - air cycle refrigeration - gas turbine cycles - open and closed cycle - regeneration and intercooling - vapour power cycles - Mollier diagrams - Rankine cycle - vapour compression refrigeration cycle

Module III (13 hours)

Conventional and non-conventional energy sources - thermal power plants - steam power plant layout - study of various systems - steam generators - high pressure boilers - steam power plant accessories - IC engine and gas turbine power plants - study of various systems and accessories - hydel plants - layout and classification - components and their functions

Module IV (13 hours)

Steam turbine - impulse and reaction turbine - compounding - velocity diagrams - reheat factor - various efficiencies - turbine characteristics governing - operation and maintenance - gas turbine - aviation and industrial applications - single stage and multistage turbines - air compressors - reciprocating and rotary compressors

Text books

1. Prakash R. & Gupta, *Engineering Thermodynamics* , Nem Chand
2. Morse F.T., *Power Plant Engineering* , Affiliated East West

Reference books

1. Saad M.A., *Thermodynamics for Engineers* , Prentice Hall of India
2. Spalding D.B. & Cole E.H., *Engineering Therm odynamics* , ELBS
3. Doolittle J.S. & Hale F.J., *Thermodynamis for Engineers* , John Wiley
4. Skrotsky B. & Vopat, *Power Station Engineering* , Tata McGraw Hill
5. Holman J.P., *Heat Transfer* , McGraw Hill

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University examination pattern

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EE2K 304 : ELECTRONICS I

3 hours lectur e & 1 hour tutorial per week

Module I: Semiconductors and devices (14 hours)

Field intensity - potential energy - mobility - conductivity - electrons and holes - charge density in semiconductors - electrical properties of silicon and germanium - diffusion - potential variation within graded semiconductors - open circuit p-n junction - p-n junction as a rectifier - V-I characteristics - temperature dependence - diode resistance - transition capacitance - minority carrier storage - diffusion capacitance - breakdown diode - schottky diode - junction transistor - current components - construction - CE and CB characteristics - ratings - construction and characteristics of JFETS and MOSFETS

Module II: Diode circuits (12 hours)

Diode as a circuit element - load line - piecewise linear model - single phase half wave and full wave rectifier circuits - voltage regulation - ripple factor - rectifier efficiency - transformer utilization factor - bridge rectifier- rectifier filters - LC and LC filters and comparison - diode currents and supply line currents for various filters - diode clipping circuits - single level and two level clippers - clamping circuits - clamping circuit theorem

Module III: Amplifier circuits (13 hours)

Operating point of a BJT - bias stability - thermal runaway - fixed bias and self bias design - concept of small signal operation - amplification in CE amplifier - transconductance and its relation to CE voltage gain - h parameter model of a BJT- CE, CB and Emitter follower analysis and comparison using hybrid equivalent circuit - considerations in cascading transistor amplifiers - biasing a JFET and MOSFET - small signal model - CS and CD amplifiers - Class B and Class AB - power amplifiers using BJT

Module IV: Frequency response of amplifiers (s-domain approach is envisaged) (13 hours)

Low frequency response of BJT and FET amplifiers - dominant time constant - selection of coupling and bypass capacitors - hybrid Π equivalent circuit of BJT - high frequency response of CE current gain - α cut off and β cut off frequencies - gain bandwidth product - miller effect - emitter follower at high frequencies - FET at high frequencies - differential amplifiers - common mode and differential mode gains - CMMR - current source biasing - offset behavior

Reference books

1. Millman J., *Microelectronics* , McGraw Hill
2. Schilling & Belove, *Electronic Circuits,* McGraw Hill
3. Sedra & Smith, *Microelectronic Circuits* Oxford University Press
4. Jaeger R.C., *Micro electronic Circuit Design* , McGraw Hill
5. Horowitz P. & Hill W., *The Art of Electronics* , Foundation
6. Boylested & Nashesky, *Electronic Devices & Circuit Theory* , Prentice Hall of India

Sessional work assessment	
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EE2K 305 : ELECTRIC CIRCUIT THEORY

3 hours lectu re and 1 hour tutorial per week

Module I: S-domain analysis of circuits (13 hours)

Laplace transform - transform pairs - gate functions - shifting theorem - solution of differential equations by Laplace transforms - initial and final value theorems - Laplace transforms of periodic signals - inversion of transforms by partial fractions - convolution theorem and convolution integral - transformation of a circuit into s-domain - transformed equivalent of inductance - capacitance and mutual inductance - impedance and admittance in the transform domain - node analysis and mesh analysis of the transformed circuit - nodal admittance matrix and mesh impedance matrix in the s -domain - solution of transformed circuits including mutually coupled circuits - input and transfer immittance functions - transfer functions - impulse response and transfer function - poles and zeros - pole zero plots.- sinusoidal steady state from Laplace transform inversion - frequency response by transform evaluation on $j\omega$ axis - frequency response from pole-zero plot by geometrical interpretation

Module II (13 hours)

Fourier series: Fourier series representation of non-sinusoidal periodic waveforms - Fourier coefficients - determination of coefficients - waveform symmetry - exponential Fourier Series - discrete amplitude and phase spectra - steady state solution of circuits with non-sinusoidal periodic inputs by Fourier series - harmonics in three phase sources - harmonic currents in star and delta connected non-linear loads - triplen harmonics in three phase voltages and currents

Fourier transforms: Fourier representation of aperiodic signals - Fourier transform and inverse transform - transform pairs - properties of Fourier transforms - continuous amplitude and phase spectra - frequency response function - impulse response and its Fourier transform - relation between Laplace transforms and Fourier transforms - power spectral density - energy spectral density - Parseval's theorem - signal transmission systems - signal distortion - bandwidth requirement for signal transmission

Module III (14 hours)

Two port networks: Two port networks - characterization in terms of impedances and admittances - hybrid and transmission parameters - inter relationships among parameter sets - reciprocity theorem - interconnection of two port networks - series, parallel and cascade - network functions - pole zero plots and steady state response from pole - zero plots

Symmetrical two port networks: T and Π equivalent of a two port network - image impedance - characteristic impedance and propagation constant of a symmetrical two port network - properties of a symmetrical two port network

Symmetrical two port reactive networks as filters: Filter fundamentals - pass and stop bands - behavior of iterative impedance - constant-k low pass filter - constant-k high pass filter - m-derived T and Π sections and their applications for infinite attenuation and filter terminations-band pass and band elimination filters

Module IV (12 hours)

Introduction to network topology: Definition of graph, trees, incidence matrix - properties of incidence matrix - cut sets - fundamental cut sets - cut set schedule - tie sets - fundamental tie sets - tie set schedule - relationships among incidence matrix, cut set matrix and tie set matrix - Kirchhoff's laws in terms of network topological matrices - formulation and solution of network equations using topological methods - loop analysis - cut set analysis

Reference books

1. Desoer C.A. & Kuh E.S., *Basic Circuit Theory* , McGraw Hill
2. Siskind C.S., *Electrical Circuits,* McGraw Hill
3. Ryder J.D., *Networks, Lines & Fields* , Prentice Hall
4. Edminister, *Electric Circuits - Schaum's Outline Series,* McGraw Hill
5. Valkenberg, *Network Analysis* , Prentice Hall of India
6. Huelsman L.P., *Basic Circuit Theory,* Prentice Hall of India

Sessional work assessment	
Assignments	2x10 = 20
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Total marks	= 50

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EE2K 306 : ELECTRICAL MEASUREMENTS & MEASURING INSTRUMENTS

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)

Indicating instruments: Principle - different types of control and damping arrangements in indicating instruments - permanent magnet moving coil, moving iron, hot wire, electrostatic and dynamometer type meters - ammeters and voltmeters - errors in indicating instruments - rectifier type meters - factors influencing its performance - digital meters - introduction - digital voltmeter - block diagram - digital multimeter - principles of ac voltage measurements - true RMS digital meter - extension of instrument range - shunts for ammeters - voltmeter multipliers - instrument transformers - current transformer - phasor diagram - ratio and phase angle error - use of instrument transformers with wattmeter - clip on meters - hall effect clip on meters - errors

Module II (13 hours)

Wattmeters, energymeters and other measuring instruments: Measurement of energy and power - dynamometer type wattmeter - error and compensation - principle of working of ampere hour meter - single and three phase energy meters - errors and compensation - calibration using wattmeter and rotating substandard - static wattmeters and energy meters - principles and block diagram - trivector meter - frequency meters - power factor meters

Module III (13 hours)

Measurement of resistance: Wheatstone bridge - Kelvin double bridge - carry foster slide wire bridge - sensitivity of dc bridges - interchange of battery and galvanometer - bridge current limitations - ohmmeter - megger - measurement of insulation resistance by direct deflection method - earth electrodes - earth resistance - earth tester - localization of cable fault by Murray and Varley loop tests

AC bridges: Measurement of inductance using Maxwell and Anderson bridges - measurement of capacitance using schering bridge

Module IV (13 hours)

Potentiometers: General principle - modern form of dc potentiometers - vernier dial principle - standardization - ac potentiometers - coordinate and polar types - application of dc and ac potentiometers

Magnetic measurements: Classification of magnetic measurements - measurement of flux and permeability - Hibbert's magnetic standard - fluxmeter - Hall Effect Gaussmeter - ballistic galvanometer - BH curve and permeability - measurement of bar and ring specimen - hysteresis measurement - core loss and measurement with Lloyd - Fisher square

Reference books

1. Golding E.W., *Electrical Measurements & Mea suring Instruments* , Wheeler Pub.
2. Cooper W.D., *Modern Electronics Instrumentation* , Prentice Hall of India
3. Stout M.B., *Basic Electrical Measurements* , Prentice Hall
4. Harris F.K., *Electrical Measurement* , John Wiley

5. Sawhney A.K., *A course in Electrical & Electro nic Measurements & Instrumentation* , Dhanpat Rai
6. Oliver & Cage, *Electronic Measurements & Instrumentation* , McGraw Hill
7. Baldwin C.T., *Fundamentals of Electrical Measurement,* Lyall Book Depo

Sessional work assessment	
Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

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Q I - 8 short type questions of 5 marks, 2 from each module
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Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

EE2K 307(P) : ELECTRONICS LABORATORY I

3 hours practicals per week

1. Use of CRO: a) Measurement of current voltage, frequency and phase shift. b) Z- modulation of frequency measurement
2. Semiconductor diodes: V-I and transfer characteristics of Si, Ge and zener diodes
3. Transistor characteristics in CB and CE configurations - Identification of cut off, active and saturation regions
4. JFET characteristics in the common source configuration- determination of equivalent circuit parameters
5. RC coupled amplifier using BJT in CE configuration- measurement of gain, input and output impedance and frequency response
6. FET amplifier- Measurement of voltage gain, current gain, input and output impedance
7. UJT relaxation oscillator- Design for a particular frequency
8. Rectifiers and filters with and without shunt capacitors- Characteristics of half-wave, full wave and bridge rectifiers- Ripple factor, Rectification efficiency, and % regulation
9. BJT emitter follower- Measurement of voltage gain, current gain, input impedance, output impedance and load characteristics
10. Characteristics of clipping and clamping circuits using diodes and zener diodes
11. Characteristics of voltage regulators- Design and testing of: a) simple zener voltage regulator b) zener regulator with emitter follower output
12. Power amplifiers- Class AB (complementary symmetry)
13. Design and set up a differential amplifier using LM 3046 and 3086 (transistor array)- measurement of common mode gain, differential gain, CMRR and frequency response

Sessional work assessment	
Lab practicals & record	= 30
2 tests	2x10 = 20
Total marks	= 50

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Faculty of Engineering

Curriculum, Scheme of Examinations and Syllabi for B.Tech Degree Programme with effect from Academic Year 2000-2001

EE : Electrical & Electronics Engineering

FOURTH SEMESTER

Code	Subject	Hours/Week			Sessional Marks	University Examination	
		L	T	P/D		Hrs	Marks
EE2K 401	Engineering Mathematics IV	3	1	-	50	3	100
EE2K 402	Linear System Analysis	3	1	-	50	3	100
EE2K 403	Mechanical Engineering II	3	1	-	50	3	100
EE2K 404	Electronics II	3	1	-	50	3	100
EE2K 405	Electrical Machines I	3	1	-	50	3	100
EE2K 406	Electrical Engineering Material Science	3	1	-	50	3	100
EE2K 407(P)	**Mechanical Engineering Lab**	-	-	3	50	3	100
EE2K 408(P)	**Electrical Measurements Lab**	-	-	3	50	3	100
TOTAL		**18**	**6**	**6**	**400**	**-**	**800**

EE2K 401 : ENGINEERING MATHEMATICS IV

(same as AI2K 301, CH2K 401,CE2K 401, EC2K 401, IC2K 401, ME2K 401, PE2K 401, PM2K 401)

3 hours lecture & 1 hour tutorial per week

Module I: Functions of a complex variable & applications I (13 hours)

Functions of a complex variable - analytic functions - Cauchy-Riemann equations - elementary functions of z - conformal mapping - bilinear transformation - Schwarz-Christoffel transformation - transformation by other functions

Module II: Functions of a complex variable & applications II (13 hours)

Integration in the complex plane - Cauchy's integral theorem - Cauchy's integral formula - series of complex terms - Taylor's series - Laurent's series - residue theorem - evaluation of real definite integrals - complex inverse integral

Module III: Ordinary differential equations & special functions (13 hours)

Power series method of solving ordinary differential equations - theoretical preliminaries - series solution of Bessel's equation - modified Bessel functions - equations solvable in terms of Bessel functions - identities for Bessel functions - orthogonality of Bessel functions - applications - Legendre polynomials

Module IV: Partial differential equations (13 hours)

Derivation of equations - D'Alembert's solution of the wave equation - characteristic and the classification of partial differential equations - separation of variables - orthogonal functions and the general expansion problem - further applications - Laplace transform methods

Text book

Wylie C.R. & Barrett L.C., *Advanced E ngineering Mathematics* , McGraw Hill

Reference books

1. Churchill R.V., Brown J.W.& Verhey R.F., *Complex Variables & Applications* , McGraw Hill

2. Kreider D.L., Kuller R.G., Ostberg D.R & Perkins F.W., *An Introduction to Linear System Analysis* , Addison Wesley
3. Kreyszig E., *Advanced Engineering Mathematics* , John Wiley
4. Pipes L.A & Harvill L.R., *Applied Mathematics for Engineers & Physicists* , McGraw Hill
5. Sokolnikoff I.S. & Redheffer R.M, *Mathematics of Physics & Modern Engineering* , McGraw Hill

Sessional work assessment	
Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern
Q I - 8 short type questions of 5 marks, 2 from each module
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EE2K 402: LINEAR SYSTEMS ANALYSIS

3 hours lecture and 1 hour tutorial per week

Module I: System concepts and modelling of systems (11 hours)

Systems - subsystems - elements - systems approach - classification of systems - static and dynamic systems - linear and nonlinear systems - distributed and lumped systems - time invariant and time varying systems - stochastic and deterministic systems - system modeling and approximations - superposition principle - homogeneity and additivity - modelling of electrical systems - active and passive elements - resistance inductance and capacitance - dynamic equations using Kirchhoff's current and voltage laws. RL, RC and RLC circuits and their dynamic equations - block diagrams and signal flow graphs - masons gain formula

Module II: Modelling of non-electrical systems (11 hours)

Modelling of translational and rotational mechanical systems - differential equations for mass spring dashpot elements, D'Alembert's principle - rotational inertia - stiffness and bearing friction - gear trains - equivalent inertia and friction referred to primary and secondary shafts - dynamic equations for typical mechanical systems - electromechanical analogues - force-current and force-voltage analogue - capacitance and resistance of thermal, hydraulic pneumatic systems - dynamic equations for simple systems - comparison of electrical, electromechanical, hydraulic and pneumatic systems

Module III: Transfer function and time domain analysis (15 hours)

Use of Laplace transforms - concept of transfer function - impulse response - convolution integral - response to arbitrary inputs - transfer function of typical systems discussed in Module I - time domain analysis - test inputs - step - velocity and ramp inputs - transient and steady state response - first and second order - under damped and over damped responses - maximum overshoot - settling time - rise time and time constant - higher order systems - steady state error - error constants and error different types of inputs - Fourier series expansion of periodic functions - symmetry conditions - exponential form of Fourier series - Fourier integrals and Fourier transform - spectral properties of signals - analysis by Fourier methods

Module IV: State space analysis and stability of systems (15 hours)

Concept of state - state space and state variables - advantage over transfer function approach - state equations for typical electrical and mechanical and electromechanical systems - representation for

linear time varying and time invariant systems - solution of state equation for typical test inputs - zero state and zero input response - concept of stability - bounded input bounded output stability - Lyapunov's definition of stability - a symptitic stability - stability in the sense of Lyapunov - Routh Hurwitz criterion of stabilty for single input single output linear systems described by transfer function model

Reference books

1. Cheng D.K. Addison Wesley, *Linear Systems Analysis* , Addison Wesley
2. Tripati J.N., *Linear Systems Analysis* , New Age International

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EE2K 403 : MECHANICAL ENGINEERING II

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)

Fluids and continuum - fluid properties - ideal and real fluids - fluid statistics - fluid pressure - manometers - hydrostatic force on plane and curved surfaces immersed in fluids - center of pressure - buoyancy - metacentric height - fluid dynamic - equation of continuity - momentum energy - laminar and turbulent flow - friction factor

Module II (13 hours)

Hydraulic machines - turbines - impulse and reaction turbines - velocity diagrams - characteristics - governing, surging and cavitation - pumps - reciprocating and centrifugal - pump performance - dimensional analysis and similitude - Buckingham's PI theorem - Raleigh's method - application of DA to problems in fluid flow - turbo machines - heat transfer - various dimension-less numbers and their significance in fluid mechanics

Module III (13 hours)

Heat transfer - basic modes - conduction - convection - radiation Fourier law - general conduction equation - one dimensional conduction in simple geometries - conduction with heat generation - critical insulation thickness - heat transfer from underground cables - extended surface heat transfer, fins - free and forced convection - empirical relations - laws of radiation - black body gray body - radiation shape factor - basic ideas of solar radiation

Module IV (13 hours)

Basic psychometry - principles of air - conditioning, unit and central system - air-conditioning processes - power plant economics - basic concepts - load curve - load duration curve - selection of units and schedule of operation - cost of energy - depreciation and replacement - tariff rate calculation

Reference books

1. Streeter V.L., *Fluid Mechanics* , McGraw Hill
2. Shames, *Mechanics of Fluids,* McGraw Hill
3. Jagadishlal, *Hydraulic Machines* , Metropolitan
4. Shepherd D. G., *Principles of Turbo Machinery* , McMillan
5. Bevan T., *Theory of Machines* , Longmans

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EE2K 404 : ELECTRONICS II

3 hours lec ture and 1 hour tutorial per week

Module 1: Feedback Amplifiers, Stability & Oscillators - S-domain approach is envisaged (13 hours) Concept of feedback - negative and positive feedback - loop gain - voltage series feedback on a single time constant voltage to voltage amplifier - advantages of negative feedback in a single time constant voltage to voltage amplifier - gain - input and output resistances - rise time - band width - nonlinearity etc - stability and positive feedback in the above amplifier - voltage shunt - current series and current shunt topologies and properties.- voltage series feedback on a second order amplifier - closed loop poles and loop gain - transient response of closed loop amplifier and loop gain - voltage series amplifier with third order open loop amplifier - pole migration to right of s-plane - bode plots of loop gain - Barkhausen's criterion for stability of feedback amplifiers - gain margin and phase margin - introduction to amplifier compensation - dominant pole compensation - oscillators - transistor phase shift oscillator - Wein's bridge oscillator

Module II: Linear Opamp Circuits (13 hours)
Operational amplifier - ideal opamp properties - properties of practical opamps (LM741, LM324, LM358, LF351 and OP07) - different stages in an opamp - internally compensated and externally compensated opamps - slew rate - offsets - analysis of opamp circuits using ideal opamp model - concept of virtual short and its relation to negative feedback - offset model of a practical opamp - non inverting amplifier - gain bandwidth product - voltage follower - inverting amplifier - summing amplifier - offset analysis of non inverting and inverting amplifiers - subtracting circuits - instrumentation amplifier - voltage to current converter for floating and grounded loads - opamp integrator - opamp differentiator - series voltage regulators - monolithic regulators - three terminal regulators

Module III: Nonlinear IC Applications (13 hours)
Regenerative comparator circuits using opamps - comparator IC LM311 and its applications - square, triangle and ramp generator circuits using opamps and comparator ICs - effect of slew rate on waveform generation - study of function generator IC ICL8038 - principles of VCO circuits -

opamp based astable and monostable circuits - precision half wave and full wave rectification using opamps - log and anti-log amplifiers and applications - analog multiplier based on log/antilog amplifiers - phase locked loops - principles - lock and capture ranges - capture process - loop filter - PLL dynamics under locked condition - study of NE564 and CD4046 - applications of PLL in signal reconstruction - noise rejection - frequency multiplication - frequency synthesis - FSK demodulation - FM demodulation - line synchronization etc. timer - 555 applications

Module IV: Signal conditioning and signal conversion (13 hours)
Active filtering - Butterworth lowpass filter functions - lowpass filter specifications - Order and cut off frequency of Butterworth function from lowpass specifications - Sallen and Key second order LP section - gain adjustment in Butterworth LP filters - Butterworth high pass filters - second order wide band and narrow band bandpass filters - multiple feedback single OPAMP LPF, HPF and BPF - analog switches - sample and hold amplifier - data conversion fundamentals - D/A conversion - weighed resistor DAC - R/2R ladder DAC - current switching DAC - multiplying DAC - bipolar DACs - A/D conversion - quantiser characteristics - single slope and dual slope ADCs - counter ramp ADC - tracking ADC - successive approximation ADC - simultaneous ADC

Reference books

1. Millman J., *Microelectronics* , McGraw Hill
2. Schilling & Belove, *Electronic Circuits* , McGraw Hill
3. Sedra & Smith, *Microelectronic Circuits* , Oxford University Press
4. Jaeger R.C., *Microelectronic Circuit Design,* McGraw Hill
5. Anvekar D.K. & Sonde B.S., *Electronic Data Converters* , Tata McGraw Hill
6. Gayakwad R.A., *OPAMPS & Linear Integrated Circuits* , Prentice Hall of India
7. Clayton G.B., *Operational Amplifiers* , ELBS
8. Frederiksen T.M., *Intuitive Operational Amplifiers* , McGraw Hill

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

EE2K 405 : ELECTRICAL MACHINES I

3 hours lecture and 1 hour tutorial per week

Module I (10 hours)
Electromagnetic machines: fundamental principles - classification - generators, motors and transformers - elements of electromagnetic machines - armature windings - commutator winding - lap winding and wave winding - phase winding - single phase winding and three phase winding - single layer winding and double layer winding - MMF of a winding - space harmonics - torque developed in a winding - EMF developed in a winding - distribution factor - chording factor

Module II (12 hours)
DC machines: construction - principle of operation - magnetic circuit - flux distribution curve in the air-gap - EMF equation - armature reaction - demagnetising and cross magnetising ampere turns - commutation - methods of excitation - generators and motors

Module III (14 hours)

DC generators: power flow diagram - circuit model - magnetisation characteristics - process of voltage build up - terminal characteristics - control of terminal voltage - parallel operation - applications

DC Motors: power flow diagram - circuit model - back EMF - torque and speed equations - performance characteristics - applications - starting methods - design of starters - methods of speed control - testing - Swinburne's test - Hopkinson's test - separation of losses - retardation test - permanent magnet DC motor

Module IV (16 hours)

Transformers: types and construction - principle of operation - magnetising current - harmonics - ideal and real transformer - dot convention - current and voltage ratio - equivalent circuit - phasor diagram - per unit impedance - losses - efficiency and regulation - all day efficiency - OC and SC tests - Sumpner's test - Parallel operation - tap changing - switching transients - auto transformers - voltage and current relationships - saving of copper - different connections of three phase transformers - notations - Scott connection - cooling methods

Reference books

1. Clayton & Hancock, *Performance & Design Of DC Machines* , ELBS
2. Langsdorf A.S., *Theory of DC Machinery* , McGraw Hill
3. Nagarath I.J. & Kothari D.P., *Electric Machines* , Tata McGraw Hill
4. Say M. G., *Performance & Design of AC Machines* , Pitman, ELBS.
5. Chapman S.J., *Electric Machine Fundamentals* , McGraw Hill.
6. Toro V.D., *Electrical Machines & Power Systems* , Prentice Hall.

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

EE2K 406 : ELECTRICAL ENGINEERING MATERIAL SCIENCE

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)

Conducting materials: review of metallic conduction on the basis of free electron theory - fermi-dirac distribution - variation of conductivity with temperature and composition - contact potential - materials for electric resistances, brushes of electrical machines, lamp filaments, fuses and solder

Semiconductors: Compound semiconductors - basic ideas of amorphous and organic semiconductors

Magnetic materials: classification of magnetic materials - origin of permanent magnetic dipoles - ferromagnetism - hysterisis curve - ferromagnetic domains (qualitative explanation only) - Curie -

Weiss law - hard and soft magnetic materials and applications - ferrites - design of permanent and electromagnets - magnetic materials used in electrical machines, instruments and relays

Module II (13 hours)

Dielectrics: dielectric polarization under static fields - derivation of the expression for electronic polarization in monoatomic gases - expressions for electronic, ionic and dipolar polarizations in polyatomic gases - derivation of expression for polarization in solids and liquids - clausius - mosotti relation - behaviour of dielectrics in alternating fields - complex dielectric constant - dipolar relaxation - dielectric loss - ferroelectricity - main features - domain theory and explanation of hysterisis curve - (qualitative explanations only)

Module III (13 hours)

Dielectric breakdown: mechanism of breakdown in gases, liquids and solids - factors influencing dielectric strength - capacitor materials

Insulating materials: good insulator properties and classification on temperature basis - common insulator materials used in electrical apparatus - inorganic materials (mica, glass, porcelain, asbestos) - organic materials (paper, rubber, cotton silk fibre, wood, plastics, bakelite) - resins and varnishes - liquid insulators (transformer oil) - gaseous insulators (air, SF6, and hydrogen) - ageing of insulators

Module IV (13 hours)

Solar energy materials: photothermal conversion - use of coatings for enhanced solar thermal energy collection - solar selective coatings - cold mirror coatings - heat mirror coatings - antireflection coatings - photovoltaic conversion - solar cells - silicon, cadmium sulphide and gallium arsenide

Modern Techniques for Materials Studies: Optical microscopy - electron microscopy - photo electron spectroscopy - atomic absorption spectroscopy - magnetic resonance - nuclear magnetic resonance - electron spin resonance - ferromagnetic resonance - mossbauer spectroscopy

Text books

1. Dekker A.J., *Electrical Engineering Materials* , Prentice Hall of India
2. Agnihotri O.P.& Gupta B.K., *Solar selective surfaces* , John Wiley
3. Tareev, *Electrical Engineering Materials* , Mir Publications
4. Seth S.P.& Gupta P.V., *A Course in Electrical Engineering Materials* , Ganapath Rai

Reference books

1. Indulkar C.S.& Thiruvengadam S., *An Introduction to Electrical Engineering Materials* , S. Chand
2. Yu Koritsky, *Electrical Engineering Materials* , Peace Publications
3. Arumugam M., *Materials Science* , Anuradha Agencies
4. Meinal A.B.& Meinal M.P., *Applied Solar Energy - An Introduction* , Addison Wesley
5. Kapoor P.L., *Electrical Engineering Materials* , Khanna Pub.
6. Hutchison T.S. & Baird D.C., *The Physics of Engineering Solids* , John Wiley
7. Srivastava C.M. & Srinivasan C., *Science of Engineering Materi als*, Wiley Eastern

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one

Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

EE2K 407(P) MECHANICAL ENGINEERING LAB

3 hours per week

1. Fluid mechanics lab - calibration of flow meters- venturi meter, nuzzle meter, orifice meter, notches- pipe friction- metacentric height
2. Hydraulic machinery lab- characteristics of turbines and pumps- Pelton, Francis turbines- centrifugal, reciprocating, gear pumps, hydrams
3. Heat engines lab: constant speed characteristics of IC engines- SI engines, CI engines- air compressors, determination of viscosity, heat exchangers

Sessional work assessment	
Lab practicals & record	= 30
2 tests	2x10= 20
Total marks	= 50

EE2K 408(P) : ELECTRICAL MEASUREMENTS LAB

3 hours per week

1. Determination of B-H curve $\mu_r - H$ curve and $\mu_r - B$ curve of an iron ring specimen
2. Calibration of magnetic flux meter using standard solenoid and search coil and Hibbert's magnetic standard
3. Measurement of resistance using Wheat stone's bridge and Kelvin's double bridge
4. Measurement of self/mutual inductance and coupling coefficient of iron cored coil and air cored coil
5. Calibration of dynamometer type wattmeter, slide axis potentiometer/precision type vernier potentiometer
6. Extension of range of ammeter/voltmeter shunt/series resistance and calibration of the extended meters using standard ammeter/voltmeter
7. Extension of range of a dynamometer type wattmeter using CT/PT and calibration of the extended meter using a standard wattmeter
8. Calibration of single-phase energy meter by direct loading and phantom loading at various power factors
9. Calibration of 3 phase energy meter using standard wattmeter
10. Measurement of capacitance using Scheming bridge
11. Determination of hysteresis loop of an iron ring specimen using 6 point method and CRO
12. Measurement of branch voltages in a series RLC circuit using A.C potentiometer

Sessional work assessment	
Lab practicals & record	= 30
2 tests	2x10= 20
Total marks	= 50

UNIVERSITY OF CALICUT

Faculty of Engineering

Curriculum, Scheme of Examinations and Syllabi for B.Tech Degree Programme with effect from Academic Year 2000-2001

EE : Electrical & Electronics Engineering

FIFTH SEMESTER

Code	Subject	Hours/Week			Sessional Marks	University Examination	
		L	T	P/D		Hrs	Marks
EE2K 501	Software Engineering	3	1	-	50	3	100
EE2K 502	Analog & Digital Communication Systems	3	1	-	50	3	100
EE2K 503	Electromagnetic Field Theory	3	1	-	50	3	100
EE2K 504	Pulse & Digital Electronics	3	1	-	50	3	100
EE2K 505	Electrical Machines II	3	1	-	50	3	100
EE2K 506	Elective I	3	1	-	50	3	100
EE2K 507(P)	**Electronics Lab II**	-	-	3	50	3	100
EE2K 508(P)	**Electrical Machines Lab I**	-	-	3	50	3	100
TOTAL		**18**	**6**	**6**	**400**	**-**	**800**

Elective I

EE2K 506A - Numerical Analysis
EE2K 506B - Electrical Network Theory
EE2K 506C - High Voltage Engineering
EE2K 506D - Digital System Design
EE2K 506E - Object Oriented Programming

EE2K 501 : SOFTWARE ENGINEERING

(common to all programmes)

3 hours lecture and 1 hour tutor ial per week

Module I (13 hours)

Introduction : FAQs about software engineering - professional and ethical responsibility - system modeling - system engineering process - *the software process* - life cycle models - iteration - specification - design and implementation - validation - evolution - automated process support - *software requirements* - functional and non-functional requirements - user requirements - system requirements - SRS - *requirements engineering processes* - feasibility studies - elicitation and analysis - validation - management - *system models* - context models - behavior models - data models - object models - CASE workbenches

Module II (13 hours)

Software prototyping - prototyping in the software process - rapid prototyping techniques - *formal specification* - formal specification in the software process - interface specification - behavior specification - *architectural design* - system structuring - control models - modular decomposition - domain-specific architectures - distributed systems architecture - *object-oriented design* - objects and classes - an object oriented design process case study - design evolution - *real-time software design* - system design - real time executives - *design with reuse* - component-based development - application families - design patterns - *user interface design* - design principles - user interaction - information presentation - user support - interface evaluation

Module III (13 hours)

Dependability - critical systems - availability and reliability - safety - security - critical systems specifications - critical system development - *verification and validation* - planning - software inspection - automated static analysis - clean room software development - *software testing* - defect testing - integration testing - object-oriented testing - testing workbenches - critical system validation - *software evolution* - legacy systems - software change - software maintenance - architectural evolution - software re-engineering - data re-engineering

Module IV (13 hours)

Software project management - project planning - scheduling - risk management - *managing people* - group working - choosing and keeping people - the people capability maturity model - *software cost estimation* - productivity estimation techniques - algorithmic cost modeling - project duration and staffing - *quality management* - quality assurance and standards - quality planning - quality control - software measurement and metrics - *process improvement* - process and product quality - process analysis and modeling - process measurement - process CMM - *configuration management:* planning - change management - version and release management - system building - CASE tools for configuration management

Text book

Ian Sommerville, *Software Engineering* , Pearson Education Asia

Reference books

1. Pressman R.S., *Software Engineering* , McGraw Hill
2. Mall R., *Fundamentals of Software Engineering* , Prentice Hall of India
3. Behferooz A. & Hudson F.J., *Software Engineering Fundamentals* , Oxford University Press
4. Jalote P., *An Integrated Approach to Software Engineering,* Narosa

Sessional work assessment	
Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 502 : ANALOG & DIGITAL COMMUNICATION SYSTEMS

3 hours lecture and 1 hour tutorial per week

Module I (13hours)

Frequency domain representation of finite energy signals and periodic signals - energy spectral density and power spectral density - convolution theorem - response of linear time invariant system - sampling and reconstruction - Nyquist sampling theorem - random processes - ensemble and time averages - Stationarity - correlation theory for wide sense stationary processes - wiener-Khinchin-Einstein theorem - properties of Gaussian random processes - white noise - response of LTI system to white Gaussian noise

Module II (13 hours)

Amplitude modulation - spectrum - power relations - modulator and demodulator circuits - AM transmitter block diagram - tuned radio frequency and superheterodyne receivers - calculation of signal to noise ratio for envelope detection and coherent detection of AM - principle of single side band suppressed carrier modulation - frequency modulation - deviation - modulation index -

spectrum of FM signal - relationship between phase modulation and FM - JFET reactance modulator - FM transmitter block diagram - foster Sceley discriminator - SNR calculation - pre-emphasis and de-emphasis

Module III (13 hours)
Analog modulation scheme - PAM - PWM - PPM - digital pulse modulation scheme - PCM - DPCM and delta modulation - base band data transmission - base band transmission model - additive white gaussian noise channel - matched filter receiver - inter symbol interference - basic ideas of pulse shaping - equalization - synchronization - scrambling and line coding - digital pass band transmission - elements of digital pass band transmission - pass band transmission model - coherent binary modulation schemes: ASK - PSK and FSK - multilevel signaling schemes - average probability of error - bit error rate - concept of an optimal receiver

Module IV (13 hours)
Elements of information theory - measure of information - Shanon's source coding and channel coding theorems - discrete memory - less channel - Shanon-Hartley theorem - error control strategies - principles of forward error correction and ARQ - linear block codes and syndrome decoding - elements of data communication - transmission impairments - synchronous and asynchronous transmission - multiple access - FDM - synchronous and statistical TDM - CDMA - frequency hopped and direct sequence CDMA - computer networks - network topologies - circuit switching - packet switching - basic concepts of network protocols - OSI

Reference books

1. Simon Haykin, *Communication Systems,* John Wiley
2. Ziemer R.E. & Tranter W.H., *Principles of Communications* , JAICO Publishing House
3. Roddey D. & Coolen J., *Electronics Communications* , Prentice Hall of India
4. Samshanmugham K., *Digital and Analog Communications* , John Wiley
5. Andy Bateman, *Digital Communication: Design for The Real world,* Addison Wesley
6. Lathi B.P., *Modern Digital and Analog Communication Systems* , Oxford University Press
7. Simon Haykin, *An Introduction to Analog and Digital Communication Systems* , John Wiley

Sessional work assessment	
Test	2 x 15 = 30
Assignment	2 x 10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 503 : ELECTROMAGNETIC FIELD THEORY

3 hours lecture and 1 hour tutorial per week

Module I: The electric field (12 hours)
Co-ordinate transformation - vector fields - divergence theorem - stokes theorem - static electric field - electric flux - Gauss's law - electric scalar potential - electric dipole moment - electric field polarization - condition at boundary between dielectrics, method of images - capacitance of isolated sphere - capacitance between co-axial cylinder - capacitance between parallel wires - energy density in static field - solution of Laplace's and Poisson's equation in electrostatics

Module II: The magnetic field (12 hours)

Magnetic field - steady magnetic field - conduction current - conduction current density - Biot-Savart's law and ampere's law - vector potential concept of inductance - inductance of solenoid - toroid concept of resistance - magnetic moment - torque on a loop - transmission lines - electromagnetic induction - faraday's law

Module III: Maxwell's equations (14 hours)
Continuity equation - displacement current - Maxwell's equation - plane waves - Poynting vector and Poyntings theorem - solutions for free space condition - wave equation for a conducting medium - harmonically varying field - wave polarization - linear - elliptic and circular polarization

Module IV: Waves and transmission lines (14 hours)
Wave equation on transmission line - co-axial and two wire transmission lines - phase velocity and group velocity - characteristic impedance - reflection coefficient - standing wave ratio - impedance matching - stub matching - smith chart - reflection and transmission of plane wave at boundaries - continuity equation at boundaries - dielectric - dielectric boundary - dielectric - conductor boundary - law of reflection - law of refraction (Snell's law) - concept of Brewster's angle

Text books
1. Kraus J.D., *Electromagnetics* , McGraw Hill
2. Sadiku M.N.O., *Elements of Electromagnet ics,* Addison Wesley
3. Cheng D.K., *Field and Wave Electromagnetics* , Addison Wesley
4. Premlet B., *Electromagnetic Theory with Applications* , Phasor Books

Reference books
1. Hayt W.H., *Engineering Electromagnetics,* McGraw Hill
2. Guru & Hiziroglu, *Electromagnetic Field Theory - Fundamentals*

Sessional work assessment		
Two tests	2 x 15	: 30
Two assignments	2 x 10	: 20
Total marks		: 50

University examination pattern
Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 504 : PULSE & DIGITAL ELECTRONICS

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)
Pulse circuits - forward recovery and reverse recovery of diodes - switching times of diode - switching behavior of transistors - switch-on time components - resistive switching and clamped inductive switching of BJTs and switching times - storage time and Schottky BJTs - bistable circuit - symmetrical and asymmetrical triggering of bistable - collector coupled monostable - collector coupled astable - transistor schmitt trigger circuit - voltage Sweep errors - constant current sweep circuit - miller sweep using opamps - current sweep generation

Module II (13 hours)
Logic families - ideal logic gates - truth tables of basic gates - logic levels - noise margin - basic Boolean algebra - De Morgan's theorems - DTL gates - HTL gates - TTL gates - standard TTL -

schottky TTL - ECL logic - MOS logic - NMOS logic gates - CMOS logic - tristate logic - comparison of logic families

Module III (13 hours)

Combinational circuits - number systems - Boolean functions - canonical and standard forms - simplification of Boolean functions by Karnaugh's map up to five variable map - NAND, NOR, EX-OR & EX-NOR implementation - codes and code converters - multi level NAND circuits - multi level NOR circuits - adders - subtractors - signed and unsigned numbers - one's complement and two's complement - BCD adder - magnitude comparator - BCD multiplier - decoders and encoders - multiplexers and demultiplexers - implementation of combinational logic by using multiplexers - ROM, PLA and PAL

Module IV (13 hours)

Sequential circuits and memories - flip flops - RS, JK, T and D flip flops - triggering of flip flops - registers - shift registers - ripple counters - synchronous counters - ring counter - Johnson counter - memories -ROM, static and dynamic RAM - read/write memory, EPROM, EEPROM, memory decoding - analysis of clocked sequential circuits - state tables and state diagrams - state reduction and assignment - flip flop excitation tables - algorithmic state machine design procedure - design of modulo-m counters - introduction to ASM charts

Reference books

1. Millman & Taub, *Pulse, Digital and Switching Waveforms* , TMH
2. Jaeger R.C., *Microelectroni c Circuit Design* , McGraw Hill
3. Morris Mano M., *Digital Design* , Prentice Hall of India
4. Taub & Schilling, *Digital Integrated Electronics* , McGraw Hill
5. Morris & Miller, *Designing with TTL Integrated Circuits,* McGraw Hill

Sessional work assessment	
2 Tests	2x15 = 30
2 assignments	2x10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 505 : ELECTRICAL MACHINES II

3 hours lecture and 1 hour tutorial per week

Module I (12 hours)

Alternators - construction - principle of operation - type and selection - armature reaction - voltage regulation - predetermination of voltage regulation - EMF method - synchronous reactance and short circuit ratio - MMF method - Potier method - phasor diagrams - two reaction theory - modified phasor diagram - analysis by two reaction theory - sudden short circuit - current waveforms - transient and subtransient reactances - slip test - DC excitation - static excitation - brush less excitation and self excitation - measurement of losses

Module II (14 hours)

Synchronous generator - power angle characteristics of cylindrical rotor and salient pole machines - reactance power - active and reactive power control - load sharing upon parallel operation - effect of armature reactance - automatic synchronizing - effect of change of fuel supply -

alternator connected to infinite bus - governor characteristics - synchronizing power and torque - phasor diagram for two identical generators in parallel - locus of generated voltage for constant real power and variable excitation - automatic voltage regulators - synchronous motor - principle of operation - equivalent circuit - effect of load changes on synchronous motor - mechanical load diagram - armature current as function of power developed and excitation - V curves - inverted V curves - O curves - transition of a machine from generator mode to motor mode - phasor diagram - torque and power relations - minimum excitation for given power - hunting - periodicity of hunting - suppression - different starting methods

Module III (12 hours)

Theory of induction machines - 3 phase induction motors - construction - principle of operation - rotor MMF and production of torque - slip and frequency of rotor current - phasor diagram - equivalent circuit - mechanical power developed - maximum torque - torque slip characteristics - losses and power flow - single phasing - no-load and blocked rotor tests - the circle diagram - effect of deep bar and double cage rotors - effects of air gap flux harmonics - cogging and crawling - line excited and self excited induction generators - single phase induction motors - double revolving field theory - equivalent circuit - principle of operation of linear induction motor - applications of all types of induction motors

Module IV (14 hours)

Starting and speed control of induction motors - starting methods for three phase induction motors - direct on line starting - auto transformer starting - star delta starting - rotor resistance starting - starters and contactors - speed control - basic methods - voltage control - frequency control - rotor resistance control - pole changing - static frequency conversion and slip power recovery scheme - starting methods of single phase induction motors - generalised machine theory - diagrammatic representation of generalised machine - formation of emf equations - expressions for power and torque - representation of dc machine, synchronous machine and induction machine - formation of general equations

Reference books

1. Adkins, *General Theory of Electrical Machines* , Chapman & Hall.
2. Bimbra, *Genaralised Machine Theory* , Khanna
3. Fitzgerald A.E. & Kingsley, *Electrical Machinery* , McGraw Hill.
4. Langsdorf A.S., *Theory of A.C Machinery* , McGraw Hill.
5. Nagrath I.J. & Kothari D.P., *Electric Machines*, Tata McGraw Hill.
6. Puchestein, Lloyd & Cenrad, *Alternating Current Machines* , Asia Publishing House.
7. Say M.G., *Performance and Design of AC Machines* , Pitman, ELBS.
8. Chapman S.J., *Electric Machinery Fundamentals* , McGraw Hill.
9. Toro V.D., *Electrical Machines and Power Systems* , Prentice Hall

Sessional work assessment	
Assignments	2 x 10 = 20
2 Tests	2 x 15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short answer type questions of 5 marks each, 2 from each module.
Q II - 2 questions A and B of 15 marks each from module I with choice to answer any one.
Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one.
Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one.
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one

EE2K 506A : NUMERICAL ANALYSIS

(common for AI2K/CE2K/CH2K/EC2K/IC2K/ME2K/PM2K 506A)

3 hours lecture and 1 hour tutorial per week

Module I: Errors in numerical calculations (13 hours)
Sources of errors, significant digits and numerical instability - numerical solution of polynomial and transcendental equations - bisection method - method of false position - Newton-Raphson method - fixed-point iteration - rate of convergence of these methods - iteration based on second degree equation - the Muller's method - Chebyshev method - Graeffe's root squaring method for polynomial equations - Bairstow's method for quadratic factors in the case of polynomial equations

Module II: Solutions of system of linear algebraic equations (13 hours)

Direct methods - gauss and gauss - Jordan methods - Crout's reduction method - error analysis - iterative methods - Jacobi's iteration - Gauss-seidel iteration - the relaxation method - convergence analysis - solution of system of nonlinear equations by Newton-Raphson method - power method for the determination of eigen values - convergence of power method

Module III: Polynomial interpolation (13 hours)

Lagrange's interpolation polynomial - divided differences - Newton's divided difference interpolation polynomial - error of interpolation - finite difference operators - Gregory - Newton forward and backward interpolations - Stirling's interpolation formula - interpolation with a Cubic spline - numerical differentiation - differential formulas in the case of equally spaced points - numerical integration - trapezoidal and Simpson's rules - Gaussian integration - errors of integration formulas

Module IV: Numerical solution of ordinary differential equations (13 hours)
The Taylor series method - Euler and modified Euler methods - Runge-Kutta methods (2^{nd} order and 4^{th} order only) - multistep methods - Milne's predictor - corrector formulas - Adam-Bashforth &Adam-Moulton formulas - solution of boundary value problems in ordinary differential equations - finite difference methods for solving two dimensional Laplace's equation for a rectangular region - finite difference method of solving heat equation and wave equation with given initial and boundary conditions

Reference books

1. Froberg C.E., *Introduction to Numerical Analysis* , Addison Wesley
2. Gerald C.F., *Applied Numerical Analysis* , Addison Wesley
3. Hildebrand F.B., *Introduction to Numerical Analysis* , T.M.H.
4. James M.L., Smith C.M. & Wolford J.C., *Applied Numerical Methods for Digital Computation* , Harper & Row
5. Mathew J.H., *Numerical Methods for Mathematics, Science and Engineering* , P.H.I

Sessional work assessment	
Assignments	2×10=20
2 tests	2×15=30
Total marks	=50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions A and B of 15 marks each from module I with choice to answer any one.

Q III	- 2 questions A and B of 15 marks each from module II with choice to answer any one.
Q IV	- 2 questions A and B of 15 marks each from module II with choice to answer any one.
Q V	- 2 questions A and B of 15 marks each from module IV with choice to answer any one.

EE2K 506B : ELECTRICAL NETWORK THEORY

3 hours lecture and 1 hour tutorial per week

Module I (15 hours)

Network functions for the one port and two port - poles and zeroes of network functions - restrictions on pole and zero locations for driving point functions - restrictions on pole and zero locations for transfer - functions - time - domain behavior from the pole and zero plot - characterisation of two port in terms of impedance, admittance, hybrid and transmission parameters - relationships between parameters - interconnection of two ports - T and π equivalent of a two port - image impedance - image transfer parameter

Module II (12 hours)

Symmetrical two port reactive networks as filters - attenuation and phase shifts in symmetrical networks - lattice filters - low pass - high pass and band pass filters - Brune's positive real functions - properties of positive real functions - properties of Hurwitz polynomials

Module III (13 hours)

Elementary synthesis operations - LC network synthesis - properties of RC network functions - foster form of RC networks - properties of RL network functions - foster form of RL networks - the Cauer form of RC and RL networks

Module IV (12 hours)

RLC one terminal - pair network synthesis - minimum positive real functions - Brune's method of RLC synthesis - the method of Bott and Duffin - two terminal - pair synthesis by ladder development - the LC ladder development - the RC ladder development

Reference books

1. Van Valkenburg M.E., *Network Analysis,* Prentice Hall
2. Van Valkenburg M.E., *Introduction to Modern Network Synthesis* , John Wiley
3. Balabanian, *Network Synthesis* , Prentice Hall
4. Umesh Sinha, *Network Analysis and Synthesis,* Satya Prakashan

Sessional work assessment

2 assignments	2x10	= 20
2 tests	:2x15	= 30
Total marks		= 50

University examination pattern

QI - 8 short type of 5 marks each, 2 from each module
QII - 2 questions A and B of 15 marks each from module 1 with choice to answer any one
QIII - 2 questions A and B of 15 marks each from module 2 with choice to answer any one
QIV - 2questions A and B of 15 marks each from module 3 with choice to answer any one

QV -2 questions A and B of 15 marks each from module 4 with choice to answer any one

EE2K 506C : HIGH VOLTAGE ENGINEERING

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)

Dielectrics and dielectric breakdown - electric breakdown in gas and gas mixtures - breakdown in uniform and non-uniform fields - Paschen's law - Twon-send criterion - penning effect - streamer mechanism - corona discharge - electronegative gas - breakdown in surge voltage - time lag - practical consideration in using gases for insulation purposes - breakdown in high vacuum - breakdown in liquid dielectrics - pure liquids and commercial liquids - electronic and cavitation breakdown - suspended particle mechanism - breakdown in solid dielectrics - intrinsic - electromechanical - steamer and thermal breakdown - treeing phenomenon - partial discharge - breakdown of composite dielectrics

Module II (13 hours)

Generation of high voltages and currents - DC voltages - voltage doubler - cascade circuits - electrostatic machines - voltage stabilization - AC voltages - cascade transformers - series resonance circuits - impulse voltages - single stage and multistage circuits - wave shaping - tripping and control of impulse generators - synchronization with oscilloscope - generation of switching surge voltage - generation of impulse currents

Module III (13 hours)

Measurement of high voltages and currents - DC, AC and impulse voltages and currents - CRO - electrostatic generating and peak voltmeters, sphere gaps - factors affecting measurements - potential dividers (capacitive and resistive) - series impedance ammeters - Ragoski coils - magnetic links - hall effect generators - PT's (magnetic and capacitive types) and CT's

Module IV (13 hours)

H.V. testing of materials and apparatus - acceptance - preventive and diagnostic tests - dielectric loss measurements - Schering bridge - inductively coupled ratio arm bridge - loss measurement on complete equipment - partial discharge and ratio interference measurements - over voltage phenomenon and insulation co-ordination - traveling waves - line equations - wave transmission - reflection and attenuation - lighting phenomenon - switching surges - principles of insulation - co-ordination on HV and EHV systems - protection against surges - system grounding

Reference books

1. Bewley L.V., *Travelling Waves on Transmission,* Lines Dover Publishers
2. Kuffe E. & Abdulla M., *High Voltage Engineering,* Pergman Press
3. Naidu M.S. & Kamaraju V., *High Voltage Engineering* , Tata McGraw Hill
4. Alston L.L., *H. V. Technology,* Oxford, University Press
5. Craggs J.D & Meed J.M., *H. V. Technique,* Butterworths
6. Dieter Kind Wiley Ltd, *An Introduc tion to H.V. Experimental Technique*
7. Kreuger Haywood, *Discharge Detection in H.V. Equipment* , London
8. Thapar etal B., *Power System Transients and High Voltage Principles* , Capital Pub.
9. *IEEE Standard Technique for High Voltage Testing* , IEEE John Wiley and Sons.
10. Indian Standards,

IS : 2070 - 1962	IS : 2070 - 1962	IS : 731
IS : 2544 - 1963	IS : 2079 - 1962	
IS : 2099 - 1962	IS : 2026 - 1962	
IS : 166 - 1962	IS : 5959 - 1970	
IS : 1544 - 1964, 1970	IS : 7098 - 1973	
IS : 3070 - 1965	IS : 4004 - 1967	

IS : 6209 - 1971 IS : 4950 - 1968

11. British Standards
B5 : 3659,B5 : 3070, B5 : 2914-1957

IEC Publications
No, 99-1, Part1-1970

Sessional work assessment

Test	2 x 15 = 30
Assignment:	2 x 10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short answer type questions of 5 marks each, 2 from each module.
Q II - 2 questions A and B of 15 marks each from module I with choice to answer any one.
Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one.
Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one.
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one

EE2K 506D : DIGITAL SYSTEM DESIGN

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)
Finite state machine design - the concept of state machine - timing in state machine - FSM design procedure - ASM notation - Moore and Mealy machine design - examples of Moore and Mealy machines - finite state machine word problems

Module II (13 hours)
Asynchronous design - asynchronous ASM - asynchronous system - design principles - problem of asynchronous circuits - hazards - critical races - examples

Module III (13 hours)
Designing with programmable devices - programmable LSI techniques - PLA - logic cell array and atifuse FPGAs - designing with FPGAs - large PAL structures - MAX and XC7000 EPLDs - RAM based FPGAs - FLEX8000/10K families - selecting and using FPGAs

Module IV (13 hours)
Hardware description languages - introduction to VHDL - behavioral modeling - transport vs inertial delay - simulation deltas - sequential processing - process statement - signal assignment vs variable assignment - sequential statements - data types - subprograms and packages - predefined attributes - configurations - subprogram overloading - VHDL synthesis - design examples

Text books

1. Comer D.J., "*Digital Logic and State Machine Design* ", Saunders College publishing
2. Katz R.H., "*Contemporary Logic Design* ", Benjamin/Cummings Publishing Co.
3. Geoff Bostock, "*FPGAs and Programmable LSI* ", Butterworth Heinemann
4. Perry D.L., "*VHDL* ", McGraw Hill
5. Roth C.S., "*Fundamentals of Logic Design* ", Jaico Publishing House

Reference books

1. Zoran Salacic, "*Digital System D esign and Prototyping Using Field Programmable Logic* ", Kluwer Academic Publishers
2. Stephen Brown & Zvonoko Vranesic, "*Fundamentals of Digital Logic with VHDL Design* ", McGraw Hill
3. Bhasker J., "*A VHDL Primer* ", Addison Wesley
4. Navabi Z., "*VHDL: Analysis and Mod eling of Digital Systems* ", McGraw Hill

University examination pattern

Q I - 8 short answer type questions of 5 marks each, 2 from each module.
Q II - 2 questions A and B of 15 marks each from module I with choice to answer any one.
Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one.
Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one.
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one

EE2K 506E : OBJECT ORIENTED PROGRAMMING

(common for all programmes)

3 hours lecture and 1 hour tutorial per week

Module I (12 hours)
OOPS and Java basics - Java virtual machine - Java platform API - extended security model - applet classes - exceptions and abstract classes - Java applet writing basics - GUI building with canvas - applet security - creating window applications - writing console applications - utility and math packages

Module II (10 hours)
Swing programming - working with swing components - using the clipboard - input/output streams - printing - working with 2D and 3D Graphics - using audio and video - creating animations

Module III (10 hours)
Java beans development kit - developing beans - notable beans - network programming - client and server Programs - naming and directory services - working with Java management APIS

Module IV (20 hours)
Distributed application architecture - CORBA - RMI and distributed applications - working with remote objects - object serialization and Java spaces - Java IDL and ORBs, connecting to database - using JDBC - integrating database - support into web applications - Java servlets - JSDK - JAR files - Java native interface

Text books

1. Campione, Walrath & Huml Tutorial team, "*The Java Tutorial Continue d: The Rest of the JDK*", Addison Wesley
2. Jamie Jaworski, "*Java 2 Platform Unleashed: The Comprehensive Solution* ", SAMS Teachmedia

References books

1. Holzner S., *Java 2, Swings, Servlets, JDBC & Java Beans Programming* , IDG Books
2. Campione M. & Walrath K. " *The Java Tutorial: Object -Oriented Programming for the Internet*", Addison Wesley
3. Naughton Patrick & Herbert Schildt, "*Java 2: The Complete Reference, 3rd Edition* ", Tata McGraw Hill

Sessional work assessment

Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each , 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 507(P) : ELECTRONICS LAB II

3 hours practic al per week

1. OPAMP circuits - design and set up of inverter - scale changer - adder - non-inverting amplifier - integrator and differentiator
2. OPAMP comparator - design and set up of schmitt trigger - window comparator
3. Phase shift and Wein's bridge oscillator with amplitude stabilization using OPAMPs
4. Waveform generation - square, triangular and sawtooth wave form generation using OPAMPs
5. Precision rectification - absolute value and averaging circuit using OPAMPs
6. Second order LP and BP filters using single OPAMP
7. Using CD 4046 (PLL), study the dynamics of set up (a) Frequency multiplier (b) FSK MOD/DEMOD using PLL
8. Set up analog to digital converter (a) successive approximation method (b) dual slope method
9. Using UPDOWN COUNTER and a DAC Ics, generate triangular waveform

a) Using Cd 40447 IC design and set up gated/ungated astable and monostable multivibrators

b) Using Cd 4093 Schmitt NAND IC design and set up astable and monostable

10. Design of Half adder and half subtractor circuits with NAND gates using mode control
    a) Design and realization of ripple counter using JK flip-flop
    b) Cascading of ripple counters
11. Design and realization of Johnson & Ring counter using (a) JK flip flop (b) shift register
12. Synchronous UP/DOWN counter design and realization
13. IC 555 applications

Sessional work assessment	
Laboratory practicals and record	= 30
Test/s	= 20
Total marks	= 50

EE2K 508(P) : ELECTRICAL MACHINES LAB I

3 hours practical per week

DC Machine

1. Obtain the open circuit characteristic at rated speed
   (a) Predetermine the OCC at different speeds
   (b) Find the critical resistance and the critical speed for a given field circuit resistance
2. Load test on DC shunt generator
   Plot the performance characteristics
3. Break test on DC shunt and series motor
   Objectives
   Plot the following characteristics

i) Efficiency vs Output
ii) Line current vs Output
iii) Speed vs Output
iv) Torque vs Speed
v) Torque vs Line current

4. Perform Swinburne's test on a DC shunt machine
   Objectives
   Predetermine the armature current and percentage efficiency when the machine operates as a motor and as a generator delivering 1/4,1/2,3/4 , full,5/4 rated output

5. Hopkinson's Test on a pair of DC machines
   Objectives
   Predetermination of the efficiency of the machine working as a motor and generator under various load conditions

6. Perform Retardation test on a DC machine
   Objectives
   i). Separate the losses
   ii). Find the moment of inertia of the rotating system

7. Separate the losses in a DC machine by conducting no load test.

8. O.C and S.C test on the single-phase transformer
   Objectives

   Predetermination of the following
   a. Efficiency at 1/4,1/2,3/4 and full loads at 0.5,0.86 and unity p.f
   ii) Regulation at same loads and p.f"s.
   iii) Equivalent circuit referred to HV and LV sides
   iv) Upf load at which efficiency is minimum

9. Separate the hysteresis and eddy current losses of a single phase transformer

10. Sumpner's test on Transformers
    Objectives
    Predetermination of efficiency and regulation curves.

11. Scott connection of the single phase transformers to find performance under various load conditions at upf and to plot the efficiency curves with
    (a) Main transformer secondary alone loaded
    (b) Teaser transformer secondary alone loaded
    (c) Balanced loading
    (d) Unbalanced loading

UNIVERSITY OF CALICUT

Faculty of Engineering

Curriculum, Scheme of Examinations and Syllabi for B.Tech Degree Programme with effect from Academic Year 2000-2001

EE : Electrical & Electronics Engineering

SIXTH SEMESTER

Code	Subject	Hours/Week			Sessional Marks	University Examination	
		L	T	P/D		Hrs	Marks
EE2K 601	Microprocessors & Microcontrollers	3	1	-	50	3	100
EE2K 602	Power Electronics	3	1	-	50	3	100
EE2K 603	Control Systems I	3	1	-	50	3	100
EE2K 604	Power Systems I	3	1	-	50	3	100
EE2K 605	Electrical Engineering Drawing	1	-	3	50	3	100
EE2K 606	Elective II	3	1	-	50	3	100
EE2K 607(P)	**Electrical Machines Lab II**	-	-	3	50	3	100
EE2K 608(P)	**Mini Project**	-	-	3	50	-	-
TOTAL		**16**	**5**	**9**	**400**	**-**	**700**

Elective II

EE2K 606A - Optimisation Techniques
EE2K 606B - Special Machines & Linear Machines
EE2K 606C - Data Structures & Algorithms
EE2K 606D - Cellular & Mobile Communication Systems
EE2K 606E - Electrical Machine Design
EE2K 606F - Computer Architecture & Organisation

EE2K 601 : MICROPROCESSORS & MICROCONTROLLERS

3 hours lecture & 1 hour tutorial per week

Module I (15 hours)

Intel 8085 and 8086 processors - architecture - memory addressing - addressing modes - instruction set - assembly language programming - assemblers - interrupts - pin configuration - timing diagrams - minimum and maximum mode - multiprocessor configuration

Module II (12 hours)

Interfacing - address decoding - interfacing chips - programmable peripheral interface (8255) - programmable communication interface (8251) - programmable timer (8253) - DMA controller (8259) - programmable interrupt controller (8257) - keyboard display interface (8279)

Module III (12 hours)

Introduction to 80386 - memory management unit - descriptors, selectors, description tables and TSS - real and protected mode - memory paging - special features of the pentium processor - branch prediction logic - superscalar architecture

Module IV (13 hours)

8051 Micro controller- Architecture- Basic Assembly Language programming Concepts- Moving data- Logical Operations- Arithmetic Operations- Jump and call Instructions-./ An 8051 Micro controller Design- Applications- Serial data Communication.

Text books

1. Gaonker R.S., *Microprocessor Architecture* , Programming and applications
2. Hall D.V., *Microprocessors & Interfacing* , McGraw Hill
3. Brey B.B., *The Intel Microprocessors - Architecture, Programming & Interfacing* , Prentice Hall
4. Liu Y.C. & Gibsen G.A., *Microcomputer System: The 8086/8088 Family* , Prentice Hall of India
5. Uffenbrick J.E., *The 8086/8088 Family: Design, Programming & Interfacing* , Prentice Hall India (P)Ltd
6. Ray A.K.& Bhurchandi K.W., Advanced Microprocessors and Peripherels, Tata McGraw Hill.
7. Ayala K.J., *The 8051 Micro controller, Architecture, Programming and Applications* , Penram International Publishing (India).

Reference books

1. Intel Data Book Vol.1, *Embedded Microcontrollers and Processors*
2. Tribel W.A. & Singh A., *The 8088 and 8086 Microprocessors,* McGraw Hill
3. Mohammed R., *Microprocessors & Microcomputer Based System Design* , Universal Bookstall
4. Intel Data Book, *EBK 6 496 16 bit Embedded Controller Handbook*
5. Intel Data Book, *EBK 6485 Embedded Microcontrollers Data Book*
6. Intel Data Book, *EBK 6486 Embedded Applications Book*

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions A and B of 15 marks each from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one

EE2K 602 : POWER ELECTRONICS

3 hours lecture an d 1 hour tutorial per week

Module I (13 hours)

Power diodes - basic structure and V-I characteristics - various types - power transistors - BJT, MOSFET and IGBT - basic structure and V-I characteristics - thyristors - basic structure - static and dynamic characteristics - device specifications and ratings - methods of turning on - gate triggering circuit using UJT - methods of turning off - commutation circuits - TRIAC

Module II (13 hours)

Line frequency phase controlled rectifiers using SCR - single phase rectifier with R and RL loads - half controlled and fully controlled converters with continuous and constant currents - SCR inverters - circuits for single phase inverters - series, parallel and bridge inverters - pulse width modulated inverters - basic circuit operation

Module III (12 hours)

AC regulators - single phase ac regulator with R and RL loads - sequence control of ac regulators - cycloconverter - basic principle of operation - single phase to single phase cycloconverter -

choppers - principle of operation - step-up and step-down choppers - speed control of DC motors and induction motors

Module IV (14 hours)
Switching regulators - buck regulators - boost regulators - buck-boost regulators - cuk regulators - switched mode power supply - principle of operation and analysis - comparison with linear power supply - uninterruptible power supply - basic circuit operation - different configurations - characteristics and applications

Text/Reference books

1. Ned Mohan et.al, *Power Electronics* , John Wiley
2. Sen P.C., *Power Electronics* , Tata McGraw Hill
3. Dubey et. al G.K., *Thyristorised Power Controllers*, Wiley Eastern Ltd.
4. Dewan & Straughen, *Power Semiconductor Circuits* , John Wiley
5. Singh M.D. & Khanchandani K.B., *Power Electronics* , Tata McGraw Hill
6. Lander C.W., *Power Electronics*, McGraw Hill
7. Sen P.C., *Modern Power Electronics* , Wheeler Publishers
8. Agarwal, *Power Electronics*

Sessional work assessment

Two tests	2 x 15 = 30
Two assignments:	2 x 10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 603 : CONTROL SYSTEMS I

3 hours lecture and 1 hour tutorial per week

Module I (14 hours)
System models - continuous time - principles of automatic control - open loop and closed loop systems - practical examples - transfer function approach - impulse response and transfer function - transfer matrix - determination of transfer functions of simple electrical & mechanical systems and control system components - analogous systems - block diagram reduction - signal flow graphs - masons' gain formula - concept of state - state variable representations for continuous time systems - transfer function from the state variable model and vice versa - transfer function decomposition for different state models - diagonalisation - state diagrams

Module II (12 hours)
System models - discrete time - sample data control systems - sampling process - mathematical analysis of the sampling process - data reconstruction and hold circuits - zero and first order hold - z-transform - inverse z-transform - solution of difference equations - pulse transfer function - system time response - discrete time state equations- z-transform decomposition - discrete time state models

Module III (14 hours)
Time domain analysis - test signals - response of systems to standard test signals - step response of second order systems - time domain specifications - steady state response - steady state error -

static & dynamic error coefficients - solution of linear time invariant state equation - state transition matrix - properties - computational methods - complete solution - solution of the discrete state equation - stability of linear systems - Routh's criterion of stability - stability in the z-plane - bilinear transformation and the w-plane - Routh's stability criterion for discrete data systems - Jury's stability test - Root locus method - construction of Root locus - effect of poles and zeros and their locations on the root locus - extension to discrete data systems

Module IV (12 hours)

Frequency domain analysis - frequency response representation - polar plot - logarithmic plots - frequency domain specifications - non-minimum phase systems - transportation lag - nyquist stability criterion - stability from polar and bode plots - relative stability - gain margin and phase margin - M-N circles - Nichol's chart - frequency response of discrete data systems - extension of frequency response methods to discrete-data systems

Reference books

1. Ogata K., *Modern Control Engineering,* Prentice Hall
2. Nagarath & Gopal, *Control System Engineering,* Wiley Eastern
3. Kuo, *Automatic Control Systems* , Prentice Hal
4. Kuo, *Analysis and Synthesis of Sampled Data Systems* , Prentice Hall
5. Ogata K., *Discrete -Time Control Systems* , Prentice Hall
6. Gibson & Tutter, *Control System Components,* McGraw Hall

Sessional work assessment

2 Tests	2x15 = 30
2 Assignments	2x10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 604 : POWER SYSTEMS I

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)

Conventional sources of electrical energy - thermal, hydroelectric, diesel and nuclear power plants - introduction to renewable energy sources - solar, wind, geothermal, tidal, magneto hydro dynamic and fuel cell power generation - power plant economics - operating costs - load factor - demand factor - diversity factor - plant factor - depreciation - tariff - economics of power factor improvement - capacity of phase advancing plant

Module II (13 hours)

Overhead transmission systems - arrangement of conductors - calculation of sag and tension - sag template - transmission line supports and their location, economic span - choice of transmission voltage - line insulation types - string efficiency - impulse ratio - arcing horns and rings - failure of insulation - corona - disruptive critical voltage - advantages and disadvantages of corona - underground cables - different types - insulation resistance - capacitance of single core cables - grading of cables - capacitance of three core cables - sheath effects - laying and testing of cables

Module III (13 hours)

Distribution systems - classification and arrangement of distribution systems - distribution substation layout and arrangement - economic loading of distribution transformers - design of feeders - Kelvin's law - considerations in primary and secondary distribution system design - current distribution and voltage drop in single-phase and three phase four-wire distribution systems - voltage drop calculation and design of distributors in ring system - improvement of existing distribution systems - LT capacitor installation - size and connection

Module IV (13 hours)

Performance of transmission lines - calculation of transmission line inductance and capacitance - GMD and GMR - bundled conductors - transposition - representation of short - medium and long lines - ABCD constants - rigorous solution of long lines - effect of capacitance - nominal T and π methods of calculations -power flow through a transmission line

Reference books

1. Turan Gonen, *Electric Power Transmission System Engineering* , John Wiley
2. Sony, Gupta, Bhatnagar, *A Course in Electrical Power* , Dhanpat Rai
3. Uppal S.L., *Electrical Power* , Khanna
4. Cotton H., *Transmission & Distribution of Electrical Energy* , English University Press
5. Starr A.T., *Generation, Transmission & Utilisation of Electric Power* , Pitman
6. Pabla A.S., *Electric Power Distribution Systems,* Tata McGraw Hill.
7. Wadhwa C.L., *Electric Power Systems,* Wiley Eastern Ltd.

Sessional work assessment	
Test	2 x 15 = 30
Assignment	2 x 10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 605 : ELECTRICAL ENGINEERING DRAWING

1 hour lecture and 3 hours drawing per week

Module I (6 hours)

Developed winding diagrams using AUTOCAD

1. Simplex lap and wave dc armature windings
2. Simplex lap and wave, integral and fractional slot, double layer three phase ac armature windings
3. Mush and concentric type single layer three phase ac armature windings

(Questions from this module are not included for the exam)

Module II (10 hours)

Transformers

1. Sectional plan and elevation of a transformer limb with windings
2. Sectional plan and elevation of the core assembly of a power transformer
3. Sectional plan and elevation of a distribution transformer tank with its accessories
4. Sketches of capacitor and oil filled type transformer bushings

Module III (8 hours)

Substation layouts

1. Layouts and single line diagrams of outdoor and indoor substations
2. Layout of a 220KV substation
3. Layout of a captive power substation
4. Single line diagram of a distribution centre

Module IV (28 hours)

DC Machines:

1. Sectional front and side elevation of armature with commutator of a dc machine
2. Sectional front and side elevation of the yoke and pole assembly with field winding of a dc machine
3. Sectional front and side elevation of an assembled dc Machine

Alternators:

1. Sectional front and side elevation of a water wheel rotor assembly with winding
2. Sectional front and side elevation of a salient pole alternator
3. Sectional front and side elevation of a turbo alternator
4. Sketches of the methods of pole fixing and slot details of turbo and water wheel alternators

Induction motors:

1. Sectional front and side elevation of a slip ring induction motor
2. Sectional front and side elevation of a squirrel cage induction motor

Reference books

1. Bhattacharya S.K., *Electrical Engineering Drawing* , Wiley Eastern.
2. Clayton & Hancock, *Performance and Design of DC Machines* , ELBS
3. Narang K.L., *A Text Book of Electrical Enginee ring Drawing,* Tech India Publications.
4. Sawhney, *Electrical Machine Design* , Dhanpath Rai
5. Say M.G., *Performance and Design of AC machines* , Pitman, ELBS.

Sessional work assessment	
Assignments (class work)	= 30
Test/s	= 20
Total marks	= 50

University examination pattern

Q I - 2 questions A and B of 25 marks each from module II with choice to answer any one.

Q II - 2 questions A and B of 25 marks each from module III with choice to answer any one.

Q III - 2 questions A and B of 50 marks each from module IV with choice to answer any one.

EE2K 606A : OPTIMIZATION TECHNIQUES

(common with AI2K/CE2K/EC2K/IC2K/ME2K/PM2K 606A)

3 hours lecture and 1 hour tutorial per week

Module I: Linear programming I (13 hours)

Systems of linear equations and inequalities - convex sets - convex functions - formulation of linear programming problems - theory of simplex method - simplex algorithm - Charne's M method - two phase method - duality in linear programming - dual simplex method

Module II: Linear programming II (13 hours)

Sensitivity analysis - parametric programming - bounded variable problems - transportation problem - development of the method - integrality property - degeneracy - unbalanced problems - assignment problem - development of the Hungarian method - routing problems

Module III: Nonlinear programming (13 hours)
Mathematical preliminaries of non-linear programming - gradient and Hessian - unimodal functions - convex and concave functions - role of convexity - unconstrained optimization - fibonacci search - golden section search - optimal gradient method - classical optimization - Lagrange multiplier method - Kuhn-tucker conditions - quadratic programming - separable convex programming - Frank and Wolfe method

Module IV: Dynamic programming & game theory (13 hours)
Nature of dynamic programming problem - Bellman's optimality principle - cargo loading problem - replacement problems - multistage production planning and allocation problems - rectangular games - two person zero sum games - pure and mixed strategies - 2×m and m×2 games - relation between theory of games and linear programming

Reference books

1. Bazarra M.S., Jarvis J.J. & Sherali H.D. *'Linear Programming and Network Problems* ', John Wiley
2. Bazarra M.S., Sherali H.D. & Shetty C.M., *'Nonlinear Programming, Theory and Algorithms',* John Wiley
3. Hadley G., '*Linear Programming* ', Addison Wesley
4. Hillier F.S. & Lieberman G.J. *'Introduction to Operations Research'* , McGraw Hill
5. Ravindran A., Phillips D.T. & Solberg J.J., *Operations Research Principles and Practice* , John Wiley
6. Taha H.A., *Operations Research, An introduction'* , P.H.I.
7. Wagner H.M., '*Principles of Operations Research with Application to Managerial Decisions'* , P.H.I.

Sessional work assessment

Assignments	2x10=20
2 tests	2x15=30
Total marks	=50

University examination pattern

Q I	- 8 short type questions of 5 marks each, 2 from each module
Q II	- 2 questions A and B of 15 marks each from module I with choice to answer any one.
Q III	- 2 questions A and B of 15 marks each from module II with choice to answer any one.
Q IV	- 2 questions A and B of 15 marks each from module II with choice to answer any one.
Q V	- 2 questions A and B of 15 marks each from module IV with choice to answer any one.

EE2K 606B : SPECIAL MACHINES & LINEAR MACHINES

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)
Servo motors - symmetrical components applied to two - phase servo motors - equivalent circuit and performance based on symmetrical components - servo motor torque - speed curves

Module II (13 hours)

Stepper motors - construction features - method of operation - drive - amplifiers and transistor logic - half stepping and the required switching sequence - the reluctance type stepper motor - ratings and other characteristics

Module III (13 hours)

Reluctance motors - general - types of synchronous motors - reluctance - motors - definitions - construction - polyphase and split phase reluctance motors - capacitor type reluctance motors - hysteresis motors - construction - polyphase - capacitor type and shaded pole hysteresis motors - universal motors - universal motors - application and torque - characteristics - essential parts of universal motors

Module IV (13 hours)

Linear machines - basic difference between LEMS and rotating - machine - classification of LEMS, linear motors and levitation machines - linear induction motors - linear synchronous motors - DC linear motors - linear levitation machines

Reference books

1. Toro V.D., *Electric Machines and Power Systems,* Prentice Hall
2. Veinott, *Fractional Horsepower Electric Motors,* McGraw Hill
3. Nasar S.A., Boldea I., *Linear Motion Electric Machine* , John Wiley

Sessional work assessment	
Test	2 x 15 = 30
Assignment:	2 x 10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 606C : DATA STRUCTURES & ALGORITHMS

(common with CE2K/EC2K 606C)

3 hours lecture and 1 hour tutorial per we ek

Module I (12 hours)

Review of data types - scalar types - primitive types - enumerated types - subranges structures types - character strings - arrays - records - sets - tiles - data abstraction - complexity of algorithms - time and space complexity of algorithms using “big oh” notation - *recursion* - recursive algorithms - analysis of recursive algorithms

Module II (12 hours)

Linear data structures - stacks - queues - lists - stack and queue implementation using array - linked list - linked list implementation using pointers

Module III (12 hours)

Non linear structures - graphs -trees - sets - graph and tree implementation using array linked list - set implementation using bit string, linked list

Module IV (16 hours)

Searching - sequential search - searching arrays and linked lists - binary search - searching arrays and binary search trees - hashing - introduction to simple hash functions - resolution of collisions - sorting: n^2 sorts - bubble sort - insertion sort - selection sort - NlogN sorts - quick sort - heap sort - merge sort - external sort - merge files

Text book

Aho A.V., Hopcroft J.E. & Ullman J.D., *Data Structures and Algorithms* , Addison Wesley

Reference books

1. Sahni S., *Data Structures, Algorithms, & Applications in C++*, McGraw Hill
2. Wirth N., *Algorithms +Data Structures = Programs* , Prentice Hall
3. Cormen T.H., Leiserson C.E., & Rivest R.L., *Introduction to Algorithms* , MIT Press

Sessional work assessment	
Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern
Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions A and B of 15 marks each from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one

EE2K 606D : CELLULAR & MOBILE COMMUNICATION SYSTEMS

3 hours lec ture and 1 hour tutorial per week

Module I: Introduction to cellular mobile systems (14 hours)
A basic cellular system - operation of cellular systems - concept of frequency reuse - cell splitting - analog systems - mobile stations - cell cite antennas & mobile antennas - co channel interference reduction - channel assignment - Doppler frequency shift - hand off and dropped cells

Module II: Digital systems (13 hours)
Introduction to digital systems - digital speech - digital mobile telephony - multiple access schemes - global systems for mobile (GSM) - TDMA and CDMA systems - third generation systems - WCDMA

Module III: Intelligent networks and signal processing (13 hours)
Application of intelligent micro cell systems - indoor communications - CDMA cellular radio network - advanced intelligent network (AIN) array - Processing principles & smart antennas - signal processing for wireless communication - channel estimation - blind detection - multi user detection

Module IV Digital modulation & coding (12 hours)

Basic digital modulation techniques - coherent and non-coherent modulation - error - correction and detection for wireless communication - PN codes - synchronisation of spread spectrum systems - radio channel models - diversity techniques for wireless systems

Text book

Lee W.C.Y, *Mobile Cellular Tele Communications,* MGH.

Reference books

1. Dr Kamilo Feher, *Wireless Digital Communications,* PHI
2. Pahlavan & Lavesque, *Wireless Information Networks,* Wiley
3. Viterbi A.J., CDMA, *Principles of Spread Spectrum Communi cations,* Addison Wesley
4. Schiller, *Mobile Communications,* Addison Wesley

Sessional work assessment

2 tests	2x15 = 30
2 Assignments	2x10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 606E : ELECTRICAL MACHINE DESIGN

3 hours lecture and 1 hour tutorial per week

Module I (14 hours)

DC machines - output equation - main dimensions - choice of specific electric and magnetic loadings - choice of speed and number of poles - design of armature conductors, slots and winding - design of air-gap, field system, commutator, interpoles, compensating winding and brushes - Carter's coefficient - real and apparent flux density - design examples

Module II (14 hours)

Transformers - single phase and three phase power transformers - output equation - main dimensions - choice of specific electric and magnetic loadings- design of core, LV winding, HV winding, tank and cooling tubes - prediction of no load current, forces on winding during short circuit, leakage reactance and equivalent circuit based on design data - design examples - design principles of current transformers - temperature rise calculations - continuous and intermittent rating

Module III (12 hours)

Alternators - salient pole and turbo alternators - output equation - main dimensions - choice of specific electric and magnetic loadings - choice of speed and number of poles - design of armature conductors, slots and winding - design of air-gap, field system and damper winding - prediction of open circuit characteristics and regulation of the alternator based on design data - design examples

Module IV (12 hours)

Induction machines - output equation - main dimensions - choice of specific electric and magnetic loadings - design of stator and rotor windings, stator and rotor slots and air-gap of slip ring and squirrel cage motors - calculation of rotor bar and end ring currents in cage rotor -

calculation of equivalent circuit parameters and prediction of magnetising current based on design data - design examples

Reference books

1. Clayton & Hancock, *Performance and Design of DC Machines* , ELBS.
2. Sawhney, *Electrical Machine Design* , Dhanpath Rai
3. Say M.G., *Performa nce and Design of AC Machines* , Pitman, ELBS

Sessional work assessment	
Assignments	2 x 10 = 20
2 Tests	2 x 15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short answer type questions of 5 marks each, 2 from each module.

Q II - 2 questions A and B of 15 marks each from module I with choice to answer any one.

Q III - 2 questions A and B of 15 marks each from module II with choice to answer any one.

Q IV - 2 questions A and B of 15 marks each from module III with choice to answer any one.

Q V - 2 questions A and B of 15 marks each from module IV with choice to answer any one.

EE2K 606F : COMPUTER ARCHITECTURE & ORGANISATION

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)

Computer abstraction and technology - basic principles - historical perspective - measuring performance - relating the metrics, evaluating, comparing and summarizing performance - case study: SPEC95 benchmark - instructions - operations and operands of the computer hardware - representing instructions - making decision - supporting procedures - beyond numbers - other styles of addressing - starting a program - case study - 80x86 instructions

Module II (13 hours)

Computer arithmetic - signed and unsigned numbers - addition and subtraction - logical operations - constructing an ALU - multiplication and division - floating point - case study - floating point in 80x86 - the processor - building a data path - simple and multicycle implementations - microprogramming - exceptions - case study - pentium pro implementation

Module III (14 hours)

Pipelining - overview - pipelined datapath - control - pipeline hazards - exceptions - superscalar and dynamic pipelining - case study - Pentium pro pipeline - memory hierarchy - caches - cache performance - virtual memory - common framework for memory hierarchies - case study - Pentium pro memory hierarchy

Module IV (12 hours)

Input/output - I/O performance measures, types and characteristics of I/O devices - buses - interfaces in I/O devices - design of an I/O system - multiprocessors - programming - bus and network connected multiprocessors - clusters - network topologies

Text book

Pattersen D.A. & Hennesy J.L., *Computer Organisation and Design: The Hardware/ Software Interface* , Harcourt Asia Pte Ltd (Morgan Kaufman)

Reference books

1. Heuring V.P. & Jordan H.F., *Computer System Design and Architecture* , Addison Wesley
2. Hamacher, Vranesic & Zaky, *Computer Organisation* , McGraw Hill

Sessional work assessment	
Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 607(P) : ELECTRICAL MACHINES LAB II

3 hours labor atory peer week

3 Phase Induction Motors

1. No load and blocked rotor tests on a 3 Φ squirrel cage Induction motor and slip ring Induction motors
   (i). Conduct no load blocked rotor tests on both types of m/cs
   (ii). Determine the equivalent circuit parameters and draw the equivalent circuit
   (iii). Draw the circle diagram and there from predetermine the performance characteristics
2. Load tests on 3 Φ squirrel cage and slip ring Induction motors
   (i). Conduct the brake test on both types of machines
   (ii). Obtain and plot the various performance characteristics
   (iii). Find the kVAR required to improve the power factor to 0.95 at various loads and find the relation
3. Performance of Induction machine as a generator and motor
   (i). To operate the given 3 Φ Induction machine coupled with a DC machine as
   (ii). An Induction motor
   (iii). An Induction generator working in supply mains
   (iv). To conduct load test in both generating and motoring modes and plot the following characteristics on the same graph - efficiency, line current, power factor and slip as a function of output power
   (v). Plot output vs slip and obtain hysteresis power and corresponding torque
4. Pole changing as a method of speed control and load test on pole changing induction motor
   (i). To study the different modes of operation of a 3 Φ pole changing Induction motor
   (ii). Perform load test and obtain the performance characteristics and compare the results obtained for different pole combinations at different load condition
5. Speed control of 3 Φ Induction motor by variable frequency method
   (i). Plot speed vs frequency characteristics of a 3 Φ cage Induction motor under variable frequency method of speed control, under no load and constant load conditions
   (ii). Plot the different load and load conditions parameters
6. Alternator - slip test on Salient pole alternator

Objectives

(i). Conduct the slip test on 3 Φ salient pole alternator to obtain direct axis and quadrature axis reactance

(ii). Predetermine the regulation at different loads and power factors and to derive the power vs torque angle diagram

7. V curves of a 3 Φ synchronous machine

Objectives

(i). Synchronise a 3 phase alternator to the supply mains using dark or bright lamp method

(ii). Plot the V curves and inverted V curves as a generator and motor under no load condition

8. Voltage regulation of a 3 Φ alternator

Objectives

(i). Conduct open circuit and short circuit test on a 3 Φ alternator and plot OCC and SCC.

(ii). Predetermine the voltage regulation at upf, 0.8 pf, 0.5 pf lead and zero pf for half and full load by emf and mmf methods and verify these results by direct loading.

9. Single Phase Induction Motor

(i). Study the different type of single phase Induction machine

(ii). Perform no load and blocked rotor test on a single phase Induction machine and find the equivalent circuit

(iii). Predetermine the performance characteristics

(iv). Conduct speed control of a fan motor by variable voltage method and plot the different characteristics

Sessional work assessment	
Laboratory practicals and record	= 30
Test/s	= 20
Total marks	= 50

EE2K 608(P) : MINI PROJECT

3 hours per week

The project work can be a modeling/design project, experimental project or computer simulation projects in the topics of electrical & electronics engineering interest including communication engineering and computer engineering - it can be allotted as a group project with groups consisting of three to five students

The assessment of all the mini projects shall be done by a committee consisting of three or four faculty members specialised in the various fields of electrical engineering - the students will present their project work before the committee - the group average marks for the various projects will be fixed by the committee - the guides will award the marks for the individual students in a project maintaining the group average - each group will prepare the project report and submit to the department through the guide - the head of the department will certify the copies and shall retain one copy in the departmental library

Sessional work assessment	
Presentation	: 30
Report	: 20
Total marks	: 50

UNIVERSITY OF CALICUT

Faculty of Engineering

Curriculum, Scheme of Examinations and Syllabi for B.Tech Degree Programme with effect from Academic Year 2000-2001

EE : Electrical & Electronics Engineering

SEVENTH SEMESTER

Code	Subject	Hours /Week			Sessional Marks	University Examination	
		L	T	P/D		Hrs	**Marks**
EE2K 701	Industrial Management	3	1	-	50	3	100
EE2K 702	Digital Signal Processing	3	1	-	50	3	100
EE2K 703	Control Systems II	3	1	-	50	3	100
EE2K 704	Power Systems II	3	1	-	50	3	100
EE2K 705	Elective III	3	1	-	50	3	100
EE2K 706(P)	Advanced Electrical Engineering Lab I	-	-	3	50	3	100
EE2K 707(P)	Seminar	-	-	3	50	-	-
EE2K 708(P)	Project	-	-	4	50	-	-
TOTAL		15	5	10	400	-	**600**

Elective III

EE2K 705A - Biomedical Instrumentation
EE2K 705B - Industrial Psychology
EE2K 705C - Artificial Intelligence & Expert Systems
EE2K 705D - Switched Mode Power Converters
EE2K 705E - Computer Networks
EE2K 705F - Entrepreneurship
EE2K 705G - Electrical Machine Modeling & Analysis

EE2K 701 : INDUSTRIAL MANAGEMENT

(common with AI2K/CS2K/EC2K/IC2K/IT2K 701)

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)

Principles of management - management functions - planning - organising - organisation structures - span of control - delegation - directing - leadership and motivation - controlling - decision making - single stage decision making under risk - multistage decision making - decision tree - decision making under uncertainty - equally likely, minimax and maximin criteria

Module II (14 hours)

Operation management - production systems and functions - product design and selection - concept of total quality management and ISO 9000 system of standards - concept of supply chain management - project management - projects and management - network analysis - critical path method (CPM) network - finding critical path - slacks - crashing (time-cost trade off) - PERT network

Module III (12 hours)

Marketing management - concept of market and marketing - marketing function - marketing mix - market research - advertising and sales promotion - human resources management - manpower

requirement analysis - recruitment and training - job analysis - job evaluation - wages and incentives

Module IV (13 hours)

Financial management - objectives/functions - concept of time value of money - basics of financial accounting - profit and loss account - balance sheet - costing - elements of costs - cost sheet - allocation of overheads - break-even analysis depreciation - significance and methods of depreciation

Text books

1. Mazda F., *Engineering Management* , Low Price Edition, Addison Wesley
2. Buffa E.S. & Sarin R.K., *Modern Production/Operations Management* , Eighth Edition, John Wiley
3. Chase R.B., Aquilano N.J. & Jacobs F.R., *Production and Operations Management Manufacturing and Services* , Eighth Edition, Tata McGraw Hill Publishing Company Limited
4. Kolter P., *Marketing Management: Analysis, Planning, Implementation and Control* , Prentice Hall of India Private Limited
5. Venkata Ratnam C.S. & Srivastava B.K., *Personnel Management and Human Resour ces*, Tata McGraw Hill Publishing Company Limited
6. Pandey I.M., *Financial Management*, Eighth Edition, Vikas Publishing House Pvt. Ltd.
7. Bhattacharya A.K., *Principles and Practice of Cost Accounting* , Second Edition, Wheeler Publishing

Reference books

1. Koontz H., O'Donnel C. & Weihrich H., *Essentials of Management* , Fourth Edition, McGraw Hill Book Company
2. Satya Raju R. & Parthasarathy A., *Management: Text and Cases* , Prentice Hall of India Private Limited
3. Wiest J.D. & Levy F.K., *A Management Guide to PERT/CPM*, Prentice Hall of India Private Limited
4. Ramaswamy V.S. & Namakumari S., *Marketing Management: Planning, Implementation and Control* , MacMillan India Limited
5. Srinivasan R., *Case Studies in Marketing: The Indian Context* , Prentice Hall of India Private Limited
6. Majumadar R., *Marketing Research: Text, Applications and Case Studies*, New Age International (P) Limited Publishers
7. Prasanna Chandra, *Financial Management: Theory and Practice* , Fourth Edition, Tata McGraw Hill Publishing Company Limited

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions A and B of 15marks each from module I with choice to answer any one
Q III - 2 questions A and B of 15marks each from module II with choice to answer any one
Q IV - 2 questions A and B of 15marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15marks each from module IV with choice to answer any one

EE2K 702 : DIGITAL SIGNAL PROCESSING

3 hours lecture and 1 hour tutorial per week

Module I (12 hours)
Discrete signals - sequences - linear shift - invariant systems - stability and causality - difference equations - frequency domain representations - Fourier transform and its properties - sampling of continuous - time signals - Z transforms - inverse Z transforms - theorems - bilinear transformation

Module II (15 hours)
Representation of discrete Fourier series - properties of discrete Fourier series - discrete Fourier transforms - properties of DFT - linear convolution using DFT - overlap - add method - overlap - save method - FFT - Raix2 DIFT FFT algorithm - Rax2 DIFT FFT algorithm - butterfly structure - bit reversed order - in - place computations

Module III (10 hours)
Transfer function representations - discrete state variables - matrix vector representation - lattice - ladder structures - parameter quantisation effects - DSP chips - architecture of fixed point and floating point DSP core (schematics only)

Module IV (15 hours)
Digital filter design techniques - design of IIR filters from analog filters - analog to digital transformation - backward - difference and forward - difference approximations - impulse invariant transformation - bilinear transformation - prewarping - analog butterworth function for various filters - design example - properties of FIR filters - design of FIR filters using windows - comparison of IIR and FIR filters - finite word length effect in DSP

Text books

1. Oppenhiem A.V. & Schafer R.W., *Discrete -Time Signal Processing* , Prentice Hall of India
2. Mitra S.K., *Digital Signal Processing - A Computer Based Approach,* Tata McGraw Hill

Reference books

1. Ziemer R.E., Tranter W.H., & Fannin D.R, *Signals And Systems -Continuous And Discrete* , Pearson Education
2. Proakins J.G. & Manolakins D.G., *Digital Signal Processing -Principles Algorithms And Applications* , Prentice Hall of India
3. Rabiner L.R. & Gold B, *Theory and Application of Digital Signal Pr ocessing* , Prentice Hall Of India
4. Ifeachor E.C., & Jervis B.W., *Digital Signal Processing -A Practical Approach,* Addison Wesley
5. *DSP Users Manual,* Texas Instruments, TMS320C54*DSP
6. *CPU And peripherals reference set Vol. 1* , DSP solutions

Sessional work assessment	
Test	2 x 15 = 30
Assignment	2 x 10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 703 : CONTROL SYSTEMS II

3 hours lecture and 1 hour tutorial per week

Module I (12hours)
Design using conventional methods - cascade compensation - PI, PD and PID control - lead and lag compensation using RC networks - design of lead, lag and lead-lag compensators using frequency response and root locus methods - design of discrete-data systems using frequency response and root locus methods - effect of sampling period on time response

Module II (12 hours)
Non-linear systems - characteristics of non-linear systems - types of nonlinearities - phase plane analysis - construction - singular points - classification of singular points - describing function analysis - definition - describing functions of common non-linearities - stability analysis - amplitude and frequency of limit cycle using DF

Module III (10hours)
Liapunov methods - Liapunov stability - definition of stability, asymptotic stability and instability -Liapunov second method - Liapunov stability analysis of LTIV continuous time and discrete time systems

Module IV (18 hours)
Controllability, observability and introduction to optimal control - concept and criteria for controllability and observability - transfer function and controllability/observability - state feed back - design via pole - placement - introduction to optimal control - formulation of the optimal control problem - performance measure - optimal control using second method of Liapunov - the quadratic regulator problem - solution of the reduced matrix Riccati equation

Reference books

1. Ogata K., *Modern Control Engineering* , Prentice Hall
2. Nagarath & Gopal, *Control System Engineering* , Wiley Eastern
3. Kuo B.C., *Automatic Control Systems,* Prentice Hall
4. Ogata K., *Discrete -Time Control Systems* , Prentice Hall
5. Kirk D.E., *Optimal Control Theory* , Prentice Hall

Sessional work assessment

2 Tests	2x15 = 30
2 Assignments	2x10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 704 : POWER SYSTEMS II

3 hours lecture and 1 hour tutorial per week

Module I (12 hours)
Representation of power systems - one line diagrams - impedance and reactance diagrams - per unit and percent quantities - primitive and interconnected networks and their performance equations - y-bus and z-bus matrices and their formulation - effect of off nominal transformer on y-bus - load flow studies - problem formulation - classification of buses - gauss-seidal method - Newton Raphson method and fast decoupled load flow method - line loss computation - voltage dependency consideration in load modeling

Module II (14 hours)

Economic load dispatch - system constraints - economic dispatch of thermal plants neglecting line losses - optimum load dispatch including transmission line losses - exact transmission loss formula - automatic load dispatching - optimal load flow solution - speed governing mechanism - speed governing of turbo generator - load sharing and governor characteristics - transfer function model - load frequency - control of single and multi area systems - static analysis - automatic voltage regulation - IEEE type I excitation system transfer function model

Module III (12 hours)

Short circuit studies - faults on power systems - three phase to ground faults - SLGF - DLGF - LLF faults - sequence impedance and sequence network - symmetrical component methods of analysis of symmetrical and unsymmetrical faults at the terminals of an unloaded generator - fault analysis using z-bus phase shift in star - delta transformer banks - faults through impedance - short circuit capacity of a bus and circuit breaker rating

Module IV (14 hours)

Power system stability studies - steady stage - dynamic and transient stability - electrical stiffness - swing equation - inertia constant - equal area criterion applied to the case of a sudden change in mechanical power input - multi machine stability analysis using forward euler method - basic assumptions and algorithms - factors affecting stability - voltage stability problem - causes and improvement methods - subsynchronous resonance - problem - causes and mitigation methods - introduction to HVDC and flexible ac transmission (FACTS) systems

Reference books

1. Elgard O.I., *Electric Energy System Theory - An Introduction* , Tata McGraw Hill.
2. Stevenson Jr., *Elements of Power System Analysis* , Tata McGraw Hill.
3. Nagrath J. & Kothari D.P., *Modern Power System Analysis* : Tata McGraw Hill.
4. Wollenberg B.F., *Power System Engineering*
5. Kusic, *Power System Analysis*
6. Arriligga, *Power System Harmonics*
7. Gupta B.R., *Power System Analysis and Design,* Wheeler Publishing & Co.

Sessional work assessment

Test	2 x 15 = 30
Assignment	2 x 10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 705A : BIOMEDICAL INSTRUMENTATION

3 hours lecture & 1 hour tutorial per week

Module I (13 hours)

Electrical activity of excitable cells - SD curve - functional organization of the peripheral nervous system - electrocardiogram (in detail with all lead systems) - electroencephalogram - electromyogram - electroneurogram - electrode - electrolyte interface - polarisation - polarisable and non polarisable electrodes - surface electrodes - needle electrodes - micro electrodes - practical hints for using electrodes - 'skin -electrode' equivalent circuit - characteristics of 'bio - amplifiers'

Module II (13 hours)

Blood pressure - direct measurements - harmonic analysis of blood pressure waveform - systems for measuring venous pressure - heart sounds - phonocardiography - cardiac catheterisation - indirect blood pressure measurement - electromagnetic blood flow meters - ultrasonic blood flow meters - impedance plethysmography - photo plethysmography - 'indicator-dilution' method for blood flow determination - spirometry - measurement of various respiratory parameters - respiratory plethysmography - chamber plethysmography

Module III (13 hours)

Measurement of gas flow rate - cardiac pacemakers and other electric stimulators - defbrillators and cardio converters - blood pumps - hemodialysis - ventilators - infant incubators - drug delivery devices - lithotripsy - therapeutic applications of laser

Module IV (13 hours)

Physiological effects of electricity - important susceptibility parameters - macro shock hazards - micro shock hazards - protection against shock - electrical isolation - electrical safety analyzers - measurement of pH,PCO_2 and PO_2

Text books

1. Webster J.G., *Medical Instrumentation - Application and Design,* John Wiley
2. *Hand Book of Biomedical Instrumentation,* TMH
3. Raja Rao C. & Guha S.K., *Principles of Medical Electronics & Biomedical Instrumentation,* Universities Press

Reference books

1. Geddes & Baker, *Principles of Applied Biomedical Instrumentation* , Wiley
2. Wiley, *Encyclopedia of Medical Devices and Instrumentation*
3. Bronzino, *Hand book of Biomedical Engineering,* IEEE Press book

Sessional work assessment	
Test	2 x 15 = 30
Assignment	2 x 10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 705B : INDUSTRIAL PSYCHOLOGY

(common for all programmes)

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)

Introduction - psychology as a science - areas of applications - study of individual - individual differences - study of behavior - stimulus - response behavior - heredity and environment - human mind - cognition - character - thinking - attention - memory- emotion - traits - attitude - personality

Module II (13 hours)
Organizational behavior - definition - development - fundamental concept - nature of people - nature of organization - an organizational behavior system - models - autocratic model - hybrid model - understanding a social - system social culture - managing communication - downward, upward and other forms of communication

Module III (13 hours)
Motivation - motivation driver - human needs - behavior modification - goal setting - expectancy model - comparison models - interpreting motivational models - leadership - path goal model - style - contingency approach

Module IV (13 hours)
Special topics in industrial psychology - managing group in organization - group and inter group dynamics -managing change and organizational development - nature planned change - resistance - characteristic of OD - OD process

Reference books

1. Keith Davis & Newstrom J.W., "*Human Behavior At Work* ", McGraw Hill International
2. Schermerhorn J.R. Jr., Hunt J.G. & Osborn R.N., "*Managing Organizational Behavior* ", John Willy
3. Luthans, "*Organizational Behavior* ", McGraw Hill International
4. Morgan C.T., King R.A., John Rweisz & John Schoples, "*Introduction to Psychology* ", McGraw Hill
5. Blum M.L. & Naylor J.C., "*Industrial Psychology* ", CBS Publisher, Horper & Row

Sessional work assessment	
2 Tests	2 x 15 = 30
2 Assignments	2 x 10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions A and B of 15marks each from module I with choice to answer any one
Q III - 2 questions A and B of 15marks each from module II with choice to answer any one
Q IV - 2 questions A and B of 15marks each from module III with choice to answer any one
Q V - 2 questions A and B of 15marks each from module IV with choice to answer any one

EE2K 705C : ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS

(common with AI2K/EC2K/IC2K/ME2K/PE2K/PM2K 705C)

3 hours lecture and 1 hour tutorial per week

Module I (16 hours)
Definition - history and applications - propositional calculus - predicate calculus - inference rules - structures and strategies for state space search - heuristic search algorithms - heuristics in games - complexity issues - control and implementation of state space search - production systems - planning - the blackboard architecture

Module II (14 hours)
Knowledge intensive problem solving - expert system technology - rule-based expert systems - model based reasoning - case based reasoning - knowledge representation problem - reasoning with uncertain or incomplete information - statistical approach - non-monotonic systems - fuzzy

sets - knowledge representation - languages - issues - network representation - conceptual graphs - structured representation

Module III (12 hours)
Languages and programming techniques for AI - overview of LISP - search - higher order functions and procedural abstractions - search strategies - pattern matching - recursion - interpreters - logic programming in LISP - streams and delayed evaluation - expert system shell in LISP - network representations and inheritance - CLOS

Module IV (10 hours)
Introduction to understanding natural language - introduction to automated reasoning - introduction to machine learning

Text book

Luger G.F. & Stubblefield W.A., *Artificial Intelligence* , Addison Wesley

Reference books

1. Nilsson N.J., *Artificial Intelligence - A New Synthesis* , Harcourt Asia Pte. Ltd.
2. Elain Rich & Kevin Knight, *Artificial Intelligence* , Tata McGraw Hill
3. Tanimotto S.L., *The Elements of Artificial Intelligence* , Computer Science Press
4. Winston P.H., *LISP* , Addison Wesley

Sessional work assessment	
Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 705D : SWITCHED MODE POWER CONVERTERS

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)
DC-DC Converters without Galvanic Isolation - linear power supplies - overview of switching power supplies - introduction to dc - dc switched mode converters - step down converters - continuous conduction mode - boundary between continuous and discontinuous conduction - discontinuous conduction mode - output voltage ripple - step up converter - continuous conduction mode - boundary between continuous and discontinuous conduction - discontinuous conduction mode - buck boost converter - continuous conduction mode - boundary between continuous and discontinuous conduction - discontinuous conduction mode - output voltage ripple - cuk dc-dc converter - full bridge dc-dc converter - PWM with bipolar and unipolar voltage switching - dc-dc converter comparison

Module II (13 hours)
Switching dc power supplies with isolation - dc-dc converters with electrical isolation - flyback converters - double ended flyback converter - forward converters - double ended forward converter - push pull converters - half bridge converters - full bridge converters
Voltage mode control of SMPS - loop gain and stability considerations - shaping the error amp frequency response - error amp transfer function - transconductance error amps - study of popular PWM Control Ics (SG 3525,TL 494,MC34060 etc.)

Current mode control of SMPS - current mode control advantages - current mode Vs voltage mode - current mode deficiencies - slope compensation - study of a typical current mode PWM control IC UC3842

Module III (13 hours)

Switch mode dc-ac converters - basic concepts of switch mode converters - PWM switching scheme - square wave switching scheme - single phase inverters - half bridge and full bridge inverters - SPWM with bipolar and unipolar voltage switching - push pull inverters - switch utilization in single phase inverters - three phase inverters - SPWM in three phase voltage source inverters - square wave operation - switch utilisation - ripple in the inverter output - conduction of switches in three phase inverters - effect of blanking time on voltage in PWM inverters - square wave pulse switching - programmed harmonic elimination switching - current regulated modulation - Single Phase Switched Mode Rectifier and its control

Single phase utility interface - input current harmonic considerations - single phase boost type active power factor correction stage - basic operation - waveforms - current control strategies - output voltage control - power limits - power circuit design considerations - study of popular PFC Control ICs MC34062 and UC 3854

Module IV (13 hours)

Introduction to modeling of switched mode power supplies - state space averaging - state space averaged models - equivalent circuits and small signal transfer functions for basic converters

Introduction to resonant converters - classification of resonant converters - basic resonant circuit concepts - load resonant converter - resonant switch converter - zero voltage switching clamped voltage topologies - resonant DC link inverters with zero voltage switching - high frequency link integral half cycle converter

Text /reference books

1. Pressman A.I., *Switching Power Supply Design* , McGraw Hill
2. Mitchell D.M., *DC-DC Switching Regulator Analysis* , McGraw Hill
3. Ned Mohan et.al, *Power Electronics* , John Wiley
4. Otmar Kilgenstein, *Switched Mode Power Supplies in Practice* , John Wiley
5. Billings K.H., *Handbook of Switched Mode Power Supplies* , McGraw Hill
6. Nave M.J., *Power Line Filter Design for Switched -Mode Power Supplies* , Van Nostrand Reinhold

Sessional work assessment

Test	2 x 15 = 30
Assignment	2 x 10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 705E : COMPUTER NETWORKS

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)
Computer networks - local area networks - wired LANs - Ethernet - token ring - token bus - wireless LAN protocols - high speed and bridged LANs - fast Ethernet - IEEE 802.12 - FDDI - bridges

Module II (13 hours)
Wide area networks - characteristics - packet switched networks - circuit switched networks - ISDN - private networks - internetworking - architecture - internetworking issues - internet protocol standards - IP and IPv6

Module III (13 hours)
Transport protocols - user datagram protocol - transmission control protocol - protocol specification - transport layer - service definition

Module IV (13 hours)
Session layer - presentation layer - data encryption - presentation protocol - remote operations service element - commitment - concurrency and recovery - TCP/IP application protocol - directory service

Text book

Halsall F., *Data Communication, Computer Networks and Open Systems* , Addison Wesley

Reference books

1. Peterson L.L. & Davie B.S., *Computer Networks, A Systems Approach* , Harcourt Asia
2. Keshav S., *An Engineering Approach to Computer Networking* , AWL
3. Andrew S. Tanenbaum, *Computer Networks* , PHI
4. Leon-Garcia A. & Widjaja I., *Communic ation Networks* , Tata McGraw Hill
5. Bertsekas & Gallagar, *Data Networks* , PHI

Sessional work assessment	
Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 705F : ENTERPRENEURSHIP

(common for all programmes)

3 hours lecture and 1 hour tutorial per week

Module I (20 hours)
Entrepreneurial perspectives - understanding of entrepreneurship process - entrepreneurial decision process - entrepreneurship and economic development - characteristics of entrepreneur - entrepreneurial competencies - managerial functions for enterprise

Module II (10 hours)
Process of business opportunity identification and evaluation - industrial policy - environment - market survey and market assessment - project report preparation - study of feasibility and viability of a project - assessment of risk in the industry

Module III (12 hours)

Process and strategies for starting a venture - stages of small business growth - entrepreneurship in international environment - entrepreneurship - achievement motivation - time management creativity and innovation structure of the enterprise - planning, implementation and growth

Module IV (10 hours)

Technology acquisition for small units - formalities to be completed for setting up a small scale unit - forms of organizations for small scale units - financing of project and working capital - venture capital and other equity assistance available - break even analysis and economic ratios technology transfer and business incubation

Reference books

1. Harold Koontz & Heinz Weihrich, *Essentials of Management* , McGraw Hill International
2. Hirich R.D.& Peters Irwin M.P., *Entrepreneurship* , McGraw Hill
3. Rao T.V. & Deshpande M.V., Prayag Metha, Nadakarni M.S., *Developing Entrepreneurship A Hand Book,* Learning Systems
4. Donald Kurado & Hodgelts R.M., *Entrepreneurship A Contemporary Approach,* The Dryden Press
5. Dr Patel V.G., *Seven Business Crisis* , Tata McGraw Hill
6. Timmons J.A., *New Venture Creation - Entrepreneurship for 21 st Century,* McGraw Hill International
7. Patel J.B., Noid S.S., *A Manual on Business Opportunity Identification , Selections* , EDII
8. Rao C.R., *Finance for Small Sc ale Industries*
9. Pandey G.W., *A Complete Guide to Successful Entrepreneurship,* Vikas Publishing

Sessional work assessment	
Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 705G : ELECTRICAL MACHINE MODELLING & ANALYSIS

3 hours lecture and 1 hour tutorial per week

Module I: Modeling and analysis of DC machines (15 hours)

Electrodynamical equations and their solution - a spring and plunger system - rotational motion system - mutually coupled coils - Lagrange's equation - application of Lagrange's equation to electromechanical systems - solution of electrodynamical equations by Euler's method and Runge-Kutta method - linearisation of the dynamic equations and small signal stability - *the primitive 4 winding commutator machine* - the commutator primitive machine - the brush axis and its significance - self and mutually induced voltages in the stationary and commutator windings - speed e.m.f induced in commutator winding - rotational inductance coefficients - sign of speed e.m.f terms in the voltage equation - the complete voltage equation of primitive 4 winding commutator machine - the torque equation - *DC Machines* - analysis of simple DC machines using the primitive machine equations - analysis of cross-field DC machines using the primitive machine equations

Module II: Modeling and analysis of induction motors (13 hours)

The three phase induction motor - equivalent two phase machine by m.m.f equivalence - equivalent two phase machine currents from three phase machine currents - power invariant phase transformation - voltage transformation - voltage and torque equations of the equivalent two phase machine - commutator transformation and its interpretation - transformed equations - different reference frames for induction motor analysis - choice of reference frame- nonlinearities in machine equations - equations under steady state - solution of large signal transients in an induction machine - linearised equations of induction machine in current variables and flux linkage variables - small signal stability - eigen values - transfer function formulation - application of large signal and small signal equations

Module III: Modeling and analysis of synchronous machines (13 hours)

The three phase salient pole synchronous machine - three phase to two phase transformation - voltage and torque equations in stator, rotor and air-gap field reference frames - commutator transformation and transformed equations - parks transformation - suitability of reference frame Vs kind of analysis to be carried out - steady state analysis - large signal transient analysis - linearisation and eigen value analysis - general equations for small oscillations - small oscillation equations in state variable form - damping and synchronizing torques in small oscillation stability analysis - application of small oscillation models in power system dynamics

Module IV: Dynamical analysis of interconnected machines (11 hours)

Machine interconnection matrices - transformation of voltage and torque equations using interconnection matrix - large signal transient analysis using transformed equations - small signal model using transformed equations - the DC generator/DC motor system - the alternator/synchronous motor system - the Ward-Leonard system - hunting analysis of interconnected machines - selection of proper reference frames for individual machines in an interconnected system

Reference books

1. Sengupta D.P. & Lynn J.B., *Electrical Machine Dynamics*, The Macmillan Press Ltd.
2. Jones C.V., *The Unified Theory of Electrical Machines* , Butterworth
3. Woodson & Melcher, *Electromechanical Dynamics* , John Wiley
4. Kraus P.C., *Analysis of Electrical Machines* , McGraw Hill Book Company
5. Boldia I. & Nasar S.A., *Electrical Machine Dynamics* , The Macmillan Press Ltd.

Sessional work assessment	
2 Tests	2x15 = 30
2 assignments	2x10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 706(P) : ADVANCED ELECTRICAL ENGINEERING LAB I

3 hours per week

(Twelve experiments from the following topics listed will be scheduled for the laboratory depending on the availability of equipment, components etc.)

1. MATLAB- I - experiments using MTLAB tool box
2. Determination of transfer function of DC motor (a) armature control (b) field control
3. Study and experiments on (a) DC servo motor (b) AC servo motor
4. Experiments on synchros (a) characteristics (b) data transmission (b) error detection (d) differential synchro
5. Determination of transfer function of the amplidyne and load characteristics
6. Design and experimental determination of frequency response determination of lag, lead and lag-lead networks
7. Magnetic amplifier - characteristics and control circuits
8. Static and dynamic performance evaluation of transducer (a) resistance thermometer (b) vibration pick up (c) pH meter
9. Study and performance evaluation of transducers (a) strain gauge (b) inductive pick up (c) capacitive pick up (d) LVDT
10. Study and experiments on pneumatic control system
11. Microprocessor based generation of non-linear functions using proper interfacing and display devices
12. PSPICE simulation of single phase and three phase diode bridge rectifiers
13. PSPICE simulation of three phase thyristor bridge rectifier
14. Power flow analysis of the system with the given single line diagram, using the given power flow analysis package
15. Fault analysis of the system with the given single line diagram, using the given fault analysis package. Obtain the sub-transient fault currents for DLFG, DLFG, LLF faults at leach bus
16. Determination of relay characteristics

Sessional work assessment	
Laboratory practicals and record	= 30
Test/s	= 20
Total marks	= 50

EE2K 707(P) : SEMINAR

3 hours per week

Individual students should be asked to choose a topic in a field of their interest but in electrical & electronics engineering, preferably from outside the B.Tech syllabus and give a seminar on that topic for about thirty minutes - a committee consisting of atleast three faculty members (preferably specialized in different fields of engineering) shall assess the presentation of the seminars and award the marks to the students based on the merits of the topic of presentation - each student shall submit two copies of a write up of his seminar talk - one copy shall be returned to the student after duly certifying it by the chairman of the assessing committee and the other will be kept in the departmental library

Sessional work assessment	
Presentation	: 30

Report	: 20
Total marks	: 50

EE2K 708(P) : PROJECT

4 hours per week

The project work can be a design project - experimental project - investigation or computer oriented on any of the topics of electrical or electronics interest - it can be allotted as a group project consisting of a maximum number of five students - the topic of the project for any student should be different from his/her mini project

The interim assessment of all the projects should be done at the end of the seventh semester by a committee consisting of three or four faculty members specialized in the various fields of electrical engineering - the students shall present their project work before the committee for about 20 to 30 minutes duration - the complete project report is not expected at the end of the seventh semester - however a three to four page abstract based on the work done should be submitted by the students to the assessing committee - the group average marks for the various projects will be fixed by the committee - the project guides will award the marks for the individual students in a project group maintaining the group average

Sessional work assessment		
Presentation	:	30
Report	:	20
Total marks	:	50

UNIVERSITY OF CALICUT

Faculty of Engineering

Curriculum, Scheme of Examinations and Syllabi for B.Tech Degree Programme with effect from Academic Year 2000-2001

EE : Electrical & Electronics Engineering

EIGHTH SEMESTER

Code	Subject	Hours/Week			Sessional Marks	University Examination	
		L	T	P/D		Hrs	Marks
EE2K 801	Economics	3	1	-	50	3	100
EE2K 802	Industrial Drives	3	1	-	50	3	100
EE2K 803	Instrumentation Systems	3	1	-	50	3	100
EE2K 804	Power System III	3	1	-	50	3	100
EE2K 805	Elective IV	3	1	-	50	3	100
EE2K 806(P)	**Advanced Electrical Engineering Lab II**	-	-	3	50	3	100
EE2K 807(P)	**Project**	-	-	7	100	-	
EE2K 808(P)	**Viva Voce**	-	-	-	-	-	100
TOTAL		**15**	**5**	**10**	**400**	**-**	**700**
Aggregate marks for 8 semesters = 8300					**3000**		**5300**

Elective IV

EE2K 805A - Electrical System Design & Estimation
EE2K 805B - Internet Technologies
EE2K 805C - Neural Networks & Fuzzy Logic
EE2K 805D - Image Processing
EE2K 805E - Satellite Communication Systems
EE2K 805F - Electronic Commerce

EE2K 801 : ECONOMICS

(common with AI2K/CS2K/EC2K/IC2K/IT2K 801)

3 hours lecture & 1 hour tutorial per week

Module I (13 hours)

Definition of economics - nature and scope of economic science - nature and scope of managerial economics - basic terms and concepts - goods - utility - value - wealth - factors of production - land - its peculiarities - labour - its peculiarities and division of labour - capital and capital formation - organisation or enterprise - economies of large and small scale - consumption - wants - its characteristics and classification - law of diminishing marginal utility - relation between economic decision and technical decision - economic efficiency and technical efficiency

Module II (13 hours)

Demand - demand schedule - demand curve - law of demand - elasticity of demand - types of elasticity - factors determining elasticity - measurement - its significance - supply - supply schedule - supply curve - law of supply - elasticity of supply - time element in the determination of value - market price and normal price - perfect competition - monopoly - monopolistic competition

Module III (13 hours)

Forms of business - proprietorship - partnership - joint stock company - cooperative organisation - state enterprise - mixed economy - money and banking - nature and functions of money - theory of money - inflation and deflation - banking - kinds - commercial banks - central banking functions - control of credit - monetary policy - credit instrument

Module IV (13 hours)

International trade - distinction between internal and international trade - theory of international trade - free trade v/s protection - balance of trade and balance of payments - exchange control - trade policy of the Government of India - national income - concepts - measurement - difficulties in the measurement its significant - features of underdeveloped economy with special reference to India - taxation - canons of taxation - direct and indirect tax - impact and incidence of the tax - working capital - factors affecting - sources

Reference books

1. Dewett K.K. & Varma J.D., *Elementary Economic Theory* , S Chand
2. Barthwal R.R., *Industrial Economics - An Introductory Text Book* , New Age
3. Jhingan M.L., *Micro Economic Theory* , Konark
4. Samuelson P.A., *Economics - An Introductory Analysis*
5. Adhikary M., *Managerial Economics*

Sessional work assessment

2 Tests	2 x 15	= 30
2 Assignments	2 x 10	= 20
Total marks		= 50

University examination pattern

Q1 - 8 short type questions of 5 marks each, 2 from each module
QII - 2 questions A and B of 15 marks each from module I with choice to answer any one
QIII- 2 questions A and B of 15 marks each from module II with choice to answer any one
QIV- 2 questions A and B of 15 marks each from module III with choice to answer any one
QV - 2 questions A and B of 15 marks each from module IV with choice to answer any one

EE2K 802 : INDUSTRIAL DRIVES

4 hours lecture per week

Module I (13 hours)

Fundamentals of electric drives - block diagram of an electric drive - parts of electric drives - dynamics of electric drives - torque equations - speed torque conventions - loads with rotational motion - loads with translational motion - components of load torque - load equalisation - control of electrical drives - drive modeling - closed loop control - current limit control - speed sensing - current sensing - phase locked loop speed control

Module II (13 hours)

Dc motor drives - constant torque and constant power control - single phase controlled rectifiers with motor loads - fully controlled and half controlled rectifier fed dc drives - continuous and discontinuous operation - two quadrant operation - three phase controlled rectifier fed dc drives - dual converter fed control - chopper fed dc drives - closed loop speed control schemes - solar and battery powered drives - braking of dc drives

Module III (13 hours)

Three phase induction motor drives - AC voltage controlled drives - variable frequency control - VSI fed induction motor drive - operation with field weakening - CSI controlled induction motor

drives - slip power recovery scheme - rotor frequency control - single phase induction motor drives - PWM drives

Module IV (13 hours)
Synchronous motor drives - synchronous motor variable speed drives - methods of control - VSI and CSI fed drives - variable frequency control - self controlled synchronous motor drives - brushless dc motor drives - microprocessor controlled dc and ac drives - block diagrams and flow charts

Text/reference books

1. Sen P.C, *Thyristor DC Drives* , John Wiley
2. Pillai S.K, *Analysis of Thyristor Power Conditioned Motor*, University Press
3. Dubey G.K, *Fundamentals of Electric Drives* , Narosa
4. Bose B.K et al, *Microcomputer Control of Power Electronics and Drives* , IEE Press
5. Dubey G.K., *Power Semiconductor Controlled Drives* , Prentice Hall
6. Velam Subramaniam, Thyristor Control of Electric Drives, MGH

Sessional work assessment	
Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 803 : INSTRUMENTATION SYSTEMS

3 hours lecture and 1 hour tutorial per week

Module I: Transducers (14 hours)
Definition - different types of transducers - criteria for selection - general characteristics - dynamic characteristics - calibration - transducers for measurement of displacement - velocity - acceleration - speed - angular rotation - altitude - flow - liquid level - force - torque - humidity and moisture - pressure - strain and temperature Hall effect transducers and applications

Module II: Signal conditioning, data transmission and telemetry (12 hours)
Signal conditioning - instrumentation amplifiers - differential amplifier - filters - low pass - high pass - band pass and band rejection filters - transducer bridges - null type and deflection bridges - Ac bridges using push- pull transducers - data transmission and telemetry - methods of data transmission - general telemetry systems - sampling process - principles of time division and frequency division multiplexing - modulation - AM, FM, PM, PAM, FWM, PPM and PCM as applied to telemetry

Module III: Display methods, recorders, experiments and statistical analysis (14 hours)
Display methods and devices - different types of display - display system building blocks - recorders - galvanometric recorders - pen driving system - servo recorders - magnetic recorders - digital recorders - experiments and statistical analysis - performance of experiment - the record of experiment - accuracy and precision - classification of errors - the characteristics of experimental data - description of dispensed data - type of probability distribution - probability error - combination of variances - combined error - guarantee errors

Module IV: Instrumentation systems (12 hours)

Basic measuring systems - analog and digital data acquisition systems - generalized input-output configuration of measuring systems - dynamic characteristics - mathematical models - the concept of transfer function (with special reference to measuring systems) - procedure for developing transfer function - response to various types of inputs - classification of instruments based on their order & dynamic and frequency response studies - process control systems for temperature, level and pressure

Reference books

1. Doblin E.C., *Measurement System Application and Design* , McGraw Hill
2. Sawhney A.K., *A Course in Electrical and Electronic Measurements and Instrumentation* , Dhanpat Rai
3. Cooper W.D., *Electronic Instrumentation and Measurement Techniques* , Prentice Hall
4. Doblin E.O., *Measurement System Application and Design,* McGraw Hill International Editions
5. Klaassan K.B., *Electronic Measurement and Instrumentation* , Cambridge University Press

Sessional work assessment

2 Tests	2 x 15 = 30
2 Assignments	2 x 10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 804 : POWER SYSTEMS III

3 hours lecture and 1 hou r tutorial per week

Module I (13 hours)

Circuit breakers - principles of operation - different types and their operations - ABCB - oil CB - SFC - vacuum CB - circuit breaker ratings - cause of overvoltages - surges and traveling waves - voltage waves on loss less line - reflection and attenuation - protection against lightning - earth wires - lightning diverters - surge absorbers - arcing ground - neutral earthing - basic concepts of insulation levels and their selection - BIL - coordination of insulation

Module II (13 hours)

Protective relays - protective zones - requirement of protective relaying - different types of relays and their applications - generalized theory of relays - protection scheme for generator - transformers, lines and busbars - static relays - amplitude and phase comparators - block diagrams of static relays - protection scheme for generators - transformers, lines and busbars - microprocessor based protective relaying

Module III (13 hours)

Electric traction: systems of traction - speed time curve - mechanics of traction - power supply - systems of current collection - electric heating - advantage of electric heating - resistance and induction arc furnaces - construction and field of application - electric welding - high frequency power supply and the principle and application of dielectric heating

Module IV (13 hours)

Energy conservation in electric motors - lighting and electric heating systems - electrical energy auditing - instrumentation and general methodology - power quality problems - definitions - harmonics - sources - effects - total harmonic distortion (THD) - mitigation methods - passive filter design

Reference books

1. Rao S.S., *Switch Gear Protections* , Khanna
2. Thomas & Browne Jr, *Circuit Interruption - Theory and Techniques*
3. Soni, Gupta & Bhatnagar, *A Course in Electrical Power* , Dhanpat Rai
4. Van. C. Warrington A.R., *Protective Relays Vol. 1 & 2,* Chappman & Hall
5. Mason C.R., *Art and Science of Protective Relaying,* Wiley Eastern.
6. Ravindranath, Chander M., *Power System Protection and S witchgear* , Wiley Eastern
7. Haydt G.T., *Electric Power Quality,* Stars in a circle publications
8. Kazibwe W.E. & Sendula M.H., *Electric Power Quality*

Sessional work assessment	
Test	2 x 15 = 30
Assignment	2 x 10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 805A : ELECTRICAL SYSTEM DESIGN & ESTIMATION

3 hours lecture and 1 hour tutorial pe r week

Module I (13 hours)

Role of national electrical code in the design of electrical installation - electrical symbols and diagrams - design considerations of electrical installations - electric supply systems - protection and protective devices for electric installation against overload - short circuit and earth fault - electric services in building - service connections - service mains - reception and distribution of main supply - sub- circuits - neutral and earth wire - earth bus - guideline for installation of fittings - design and selection of busbars and busbar chambers - design, selection, layout, drawing and location of distribution boards and panel boards - control and switch gears - criteria for selection of HT and LT underground cables

Module II (13 hours)

Design of illumination schemes - various types of light sources - different types of lighting arrangement - energy efficiency in lamps and illumination - design considerations of good lighting schemes - design of lighting schemes for various purposes - lighting calculations - design of flood lighting and street lighting - electrical aspects and considerations for lifts, escalator services and standby generators - design and safety aspects of electrical installations for residential buildings, commercial buildings, hospitals, hotels, recreational and assembly buildings and cinema theatre

Module III (13 hours)

Electrical installations of high rise buildings - design - schematic diagram - layout - estimation and testing of rising main - main supply board and distribution boards for high rise buildings including air conditioners and lifts with provision for standby generators and its protection - lightning protection - electrical system design - estimation and costing of commercial buildings -

design considerations of electrical installations in Industries - design, estimating and costing of electrical installations for small industries

Module IV (13 hours)
Selection of EHV and HV power and distribution transformers and switchgears - case studies - design - layout - schematic diagram - estimation and costing - (a) 16 MVA - 110/11KV outdoor substation having one or two incoming and 8 or less outgoing - (b) 11KV/415V outdoor substations upto 630KVA - (c) 11KV/415V indoor substation upto 630KVA - (d) busbar trunking above 630 KVA - design of earthing system - earthmat design - design of plate and pipe earthing - shielding of electrical system

Reference books

1. Raina & Battacharya, *Electrical System Design, Estimation & Costing,* Wiley Eastern
2. Gupta J.B., *Electrical Installating, Estimating & Costing* , Kataria & Sons
3. ISI, *National Electric Code* , Bureau of Indian Standard Publications
4. *Cinema Regulation (Rules) & Act*
5. *IEEE Standards,* IEEE
6. *Relevant Indian Standard Specifications* , IS Publications.

Sessional work assessment	
Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 805B : INTERNET TECHNOLOGIES

(common with AI2K/CE2K/CH2K/EC2K/IC2K/ME2K/PE2K/PM2K 805B)

3 hours lecture and 1 hour tutorial per week

Module I (12 hours)
Computer networks and the internet - principles of application-layer protocols - HTTP - FTP - e-mail - DNS - socket programming with TCP/UDP - web servers - web pages design using HTML and XML

Module II (13 hours)
Multimedia networking - applications - streaming stored audio and video - internet telephony - RTP - scheduling and policing mechanisms - integrated services - RSVP - differentiated services - *network management* - the internet network management framework

Module III (14 hours)
Network security - *E-mail security* - privacy - S/MIME - *IP security* - overview - architecture - authentication - header and payload - combining security associations - key management - *web security* - SSL and transport layer security - SET - *systems security* - intruders and viruses - *firewalls* - design - trusted systems

Module IV (13 hours)

Mobile internet - *mobile network layer* - mobile IP - dynamic host configuration protocol -ad hoc networks - *mobile transport layer* - implications of TCP on mobility - indirect TCP - snooping TCP - mobile TCP - transmission - selective retransmission - transaction-oriented TCP - *support for mobility* - file systems - WAP protocols - WML - WML script - wireless telephony applications

Text books

1. Kurose J.F. & Ross K.W., *Computer Networking: A Top -Down Approach Featuring the Internet*, Addison Wesley, Modules I & II
2. Stallings W., *Cryptography and Network Security Principles and practice*, Pearson Education Asia, Module III
3. Schiller J., *Mobile Communications*, Addison Wesley, Module IV

Reference books

1. Deitel H.M., Deitel P.J. & Nieto T.R., *Internet and World Wide Web: How to Program*, Pearson Education Asia
2. Greenlaw R. & Hepp E., *In-line / On -line: Fundamentals of the Internet and the World Wide Web*, Tata McGraw Hill
3. Sharma V. & Sharma R, *Developing e -Commerce Sites: An Integrated Approach*, Addison Wesley
4. Singhal et. al S., *The Wireles s Application Protocol*, Pearson Education Asia
5. Goncalves M., *Firewalls: A Complete Guide*, Tata McGraw Hill

Sessional work assessment	
Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 805C : NEURAL NETWORKS & FUZZY LOGIC

(common with AI2K/CS2K/EC2K/IC2K/IT2K/ME2K/PM2K 805C)

3 hours l ecture and 1 hour tutorial per week

Module I (13 hours)

Introduction to artificial neural networks - biological neurons - Mc Culloch and Pitts modals of neuron - types of activation function - network architectures - knowledge representation - learning process - error-correction learning - supervised learning - unsupervised learning - single unit mappings and the perceptron - perceptron convergence theorem (with out proof) - method of steepest descent - least mean square algorithms - adaline/medaline units - multilayer perceptrons - derivation of the back-propagation algorithm

Module II (13 hours)

Radial basis and recurrent neural networks - RBF network structure - covers theorem and the separability of patterns - RBF learning strategies - K-means and LMS algorithms - comparison of RBF and MLP networks - recurrent networks - Hopfield networks - energy function - spurious states - error performance - simulated annealing - the Boltzman machine - Boltzman learning rule - the mean field theory machine - MFT learning algorithm - applications of neural network - the

XOR problem - traveling salesman problem - image compression using MLPs - character retrieval using Hopfield networks

Module III (13 hours)

Fuzzy logic - fuzzy sets - properties - operations on fuzzy sets - fuzzy relations - operations on fuzzy relations - the extension principle - fuzzy measures - membership functions - fuzzification and defuzzification methods - fuzzy controllers - Mamdani and Sugeno types - design parameters - choice of membership functions - fuzzification and defuzzification methods - applications

Module IV (13 hours)

Introduction to genetic algorithm and hybrid systems - genetic algorithms - natural evolution - properties - classification - GA features - coding - selection - reproduction - cross over and mutation operators basic GA and structure

Introduction to Hybrid systems - concept of neuro-fuzzy and neuro-genetic systems

Reference books

1. Haykins S., *"Neural Network a - Comprehensive Foundation"* , Macmillan College, Proc, Con, Inc
2. Zurada J.M., *"Introduction to Artificial Neural Systems,* Jaico Publishers
3. Driankov D., Hellendoorn H. & Reinfrank M., *"An Introduction to Fuzzy Control "*, Norosa
4. Ross T.J., *"Fuzzy Logic with Engineering Applications"* , McGraw Hill
5. Bart Kosko. *"Neural Networ k and Fuzzy Systems"* , Prentice Hall, Inc., Englewood Cliffs
6. Goldberg D.E., *"Genetic Algorithms in Search Optimisation and Machine Learning"* , Addison Wesley
7. Suran Goonatilake & Sukhdev Khebbal (Eds.), *"Intelligent Hybrid Systems "*, John Wiley

Sessional work assessment	
Test	2 x 15 = 30
Assignment	2 x 10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 805D : IMAGE PROCESSING

(common with EC2K 805D)

3 hours lecture and 1 hour tutorial per week

Module I (20 hours)

Introduction - digital image representation - fundamental steps in image processing - elements of digital image processing systems - *digital image fundamentals* - elements of visual perception - a simple image model - sampling and quantization - basic relationship between pixels - image geometry - image transforms - introduction to fourier transform - discrete fourier transform - some properties of 2-fourier transform (DFT) - the FFT - other separable image transforms - hotelling transform

Module II (12 hours)

Image enhancement - point processing - spatial filtering - frequency domain - color image processing - *image restoration* - degradation model - diagonalization of circulant and block circulant matrices - inverse filtering - least mean square filter

Module III (10 hours)
Image compression - image compression models - elements of information theory - error-free compression - lossy compression - image compression standards

Module IV (10 hours)
Image reconstruction from projections - basics of projection - parallel beam and fan beam projection - method of generating projections - fourier slice theorem - filtered back projection algorithms - testing back projection algorithms

Text book

Rafael C., Gonzalez & Woods R.E., *Digital Image Processing* , Addison Wesley

Reference books

1. Rosenfeld A. & Kak A.C., *Digital Picture Processing* , Academic press
2. Jain A.K, *Fundamentals of Digital Image Processing* , Prentice Hall, Englewood Cliffs
3. Schalkoff R.J., *Digital Image Processing and Computer Vision* , John Wiley
4. Pratt W.K., *Digital Image Processing* , John Wiley

Sessional work assessment	
Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 805E : SATELLITE COMMUNICATION SYSTEMS

(common with AI2K/EC2K/IC2K 805E)

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)
Satellite orbits - solar day and sidereal day - orbital parameters - satellite trajectory - period, velocity and position of a satellite - geostationary satellites - non-geostationary constellations - launching of geostationary satellites - Hohmann transfer - effect of earth's shape - other heavenly bodies - atmospheric drag and radiation pressure on the satellite's orbit

Module II (13 hours)
Communication satellites - spacecraft subsystems - payload - repeater, antenna, attitude and control systems - telemetry, tracking and command - power sub system and thermal control
Earth stations - antenna and feed systems - satellite tracking system - amplifiers - fixed and mobile satellite service earth stations

Module III (13 hours)

Communication link design - frequency bands used - antenna parameters - transmission equations - noise considerations - link design - very small aperture terminals (VSAT) - VSAT design issues

Module IV (13 hours)
Multiple access techniques - frequency division multiple access - time division multiple access - code division multiple access - access protocols for data traffic

Reference books

1. Richharia M., *Satellite Communication Systems* , Macmillan Press Ltd.
2. Gagliardi R.M., *Satellite Communication* , CBS
3. Ha T.T., *Digital Satellite Communication,* MGH

Sessional work assessment	
2 Tests	2 x 15 = 30
2 Assignments	2 x 10 = 20
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 805F : ELECTRONIC COMMERCE

(common with CS2K/IT2K 804, AI2K/EC2K/IC2K 805F)

3 hours lecture and 1 hour tutorial per week

Module I (14 hours)
Web commerce concepts - electronic commerce environment - electronic marketplace technologies - web based tools for e-commerce - e-commerce softwares - hosting services and packages - modes of e-commerce - EDI - commerce with WWW/ internet

Module II (12 hours)
Security issues - threats to e-commerce - approaches to safe e-commerce - secure transactions and protocols - intruder approaches - security strategies and tools - encryption - security teams - protecting e-commerce assets - protecting client machines - servers and channels - transaction integrity

Module III (12 hours)
Electronic payment systems - types of e-payment - internet monetary payment and security requirements - payment and purchase order process - electronic cash - electronic wallets - smart cards - credit and charge cards - risks - design of e-payment systems

Module IV (14 hours)
Strategies for marketing - creating web presence - identifying and reaching customers - web branding - sales on the web - strategies for purchasing and support activities - EDI - supply chain management - softwares for purchasing - strategies for web auctions - virtual communities and web portals - international - legal - ethical and tax issues - planning and managing e-commerce projects

Text books

1. Kalakota R. & Whinston A.B., *"Frontiers of Electronic Commerce* ", Addison Wesley
2. Schneider G.P. & Perry J.T., *Electronic Commerce, Course Technology* , Thomson Learning

Reference books

1. Westland J.C. & Clark T.H.K., "*Global Electronic Commerce"* , University Press
2. Minoli D. & Minoli E., "*Web Commerce Technology Handbook"* , Tata McGraw Hill
3. Stallings W., "*Cryptography and Network Security Principles And Practice"* , Pearson Education Asia
4. Treese G.W. & Stewart L. C., "*Designing Systems for Internet Commerce* ", Addison Wesley

Sessional work assessment	
Assignments	2x10 = 20
Tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

EE2K 806(P) : ADVANCED ELECTRICAL ENGINEERING LAB II

3 hours practical per week

(Twelve experiments from the following topics listed will be scheduled for the laboratory depending on the availability of equipment's, components etc.)

1. Study and experiments on PID controller
2. Closed loop voltage regulation of DC generator using amplidyne
3. MATLAB - II experiments using MATLAB tool box
4. Design and testing of an interrupt- driven clock using 8085 processor
5. Design and testing of an interfacing of a D/A converter with 8085 processor to generate a triangular wave
6. Design and testing of an interfacing of a D/A converter with 8085 processor to generate a sinusoidal wave
7. Design and testing of an interfacing of a A/D converter with 8085 processor using a programmable peripheral interface to read an analog signal
8. Performance evaluation of a of a full wave thyristor rectifier with R-L load
9. Performance evaluation of a buck DC-DC converter with load
10. Performance evaluation of a single phase PWM inverter with a fan/lamp load
11. Experiments on PLC based DC Servo motor trainer system
12. Experiments on PLC based AC Servo motor trainer system
13. Study and experiments of a harmonic analyzer
14. PSPICE simulation of full bridge bipolar switching DC-AC converter

15. Transient stability analysis of the system with the given single line diagram using the given software package. The disturbance is three-phase to ground solid short circuit fault at time t=0. The fault is cleared at time + = 5 cycles by permanently removing the fault line
16. Power quality studies on the given set up
17. Experiments on sphere-gaps

Sessional work assessment	
Laboratory practicals and record	= 30
Test/s	= 20
Total marks	= 50

EE2K 807(P) : PROJECT

7 hours per week

The project work started in the seventh semester will continue - the students should complete the project work in this semester and present it before the assessing committee

The assessment committee as constituted in the seventh semester, will assess the various projects, fix the group average marks - the guides will award the marks for the individual students in a project maintaining the group average - each group will submit the copies of the completed project report signed by the guide to the department - the head of the department will certify the copies and return them to the students - one copy will be kept in the departmental library

Sessional work assessment	
Presentation	: 60
Report	: 40
Total marks	: 100

EE2K 808(P) : VIVA VOCE

There is only University examination for this - examiners will be appointed by the university for conducting the viva voce - the viva voce exam will be based on the subjects studied for the B.Tech course, mini project, project and seminar reports of the student - the relative weightages would be as follows

Sessional work assessment	
Subjects	: 30
Mini project	: 20
Project	: 30
Seminar	: 20
Total marks	: 100