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BACHELOR OF ENGINEERING (ELECTRICAL & ELECTRONICS) 2011-12

SEMESTER-III
MA 301
Engineering Mathematics – III

External: 50
L T P: 3 1 0
Sessional: 50
Credits: 3
Course Duration: 45 lectures of one hour each.

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

PART A


(8 Lectures)


(7 Lectures)

Eigen values, eigen vectors, Cayley – Hamilton theorem (statement only). Similarity of matrices, Basis of eigenvectors, diagonalization (Scope as in Chapter 7, Sections 7.1, 7.5 of Reference 1).

(7 Lectures)

PART B

Complex Functions: Definition of a Complex Function, Concept of continuity and differentiability of a complex function, Cauchy – Riemann equations, necessary and sufficient conditions for differentiability (Statement only). Study of complex functions: Exponential function, Trigonometric functions, Hyperbolic functions, real and imaginary part of trigonometric and hyperbolic functions, Logarithmic functions of a complex variable, complex exponents (Scope as in Chapter 12, Sections 12.3 – 12.4, 12.6 – 12.8 of Reference 1).

(8 Lectures)

Laurent Series of function of complex variable, Singularities and Zeros, Residues at simple poles and Residue at a pole of any order, Residue Theorem (Statement only) and its simple applications (Scope as in Chapter 15, Sections 15.1 – 15.3 of Reference 1).

(7 Lectures)

Conformal Mappings, Linear Fractional Transformations (Scope as in Chapter 12, Sections 12.5, 12.9 of Reference 1).

(8 Lectures)

References:

EE-301

ELECTRIC MACHINERY-I

External: 50  L T P  Sessional: 50  3 1 0
Credits: 3

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

1. Transformers

2. Direct Current Machines
   Generators: Mechanical construction, Armature windings, Induced emf equation, Developed torque, Magnetization characteristics, Theory of commutation, Armature reaction, Types of d.c. generators, Voltage regulation, Losses, Separately excited, shunt, series and compound generators and characteristics, Maximum efficiency criterion.

Part-B

3. Polyphase Induction Machines
   Induction Generator: Motor to generator transition, Induction generator starting and operation with other three phase sources, isolated generator operation and voltage build up. [Hubert: 5.18] (15 hours)

4. Single Phase Induction Motors
   Double revolving field theory, Analysis of single phase induction motor and speed torque characteristics, Split Phase, Capacitor start, Capacitor start capacitor run motor, Permanent split capacitor motor, Shaded pole motor, Testing of single phase induction motor: No load and block rotor tests. [Guru-Hiziroglu:10.1-10.4, 10.6-10.7] (8 hours)

Text book:


Other Recommended Books:

EE- 352

ELECTRIC MACHINERY-I LAB

Sessional: 50
L T P
Credits : 2
0 0 3

Note: At least eight experiments to be done.

1. Open circuit and short circuit test of single phase/ three phase transformer and obtain its equivalent circuit.
2. Parallel operation of two single phase transformers.
4. Different winding connections of three phase two winding transformer and to identify proper combination for parallel operation.
5. Parallel operation of two three phase transformers.
8. Efficiency at different loads of the given dc shunt machine through swinburne / load test.
9. Speed control characteristics of a given dc shunt motor by (i) Armature control (ii) Field control.
10. No load and blocked rotor test on a three phase induction motor and to obtain its Equivalent circuit
11. Torque speed characteristics of three phase induction motor.
EE-302

ELECTRICAL MEASUREMENTS & MEASURING INSTRUMENTS

External: 50
L T P
Sessional: 50
3 1 0
Credits : 3

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part A

1. Units, Dimensions and Standards:

Introduction to MKS & Rationalised MKSA System, SI Units, Standards of EMF, Resistance, Capacitance and Inductance, Systematic errors

2. General Theory of Analog Measuring Instruments:

Operating torque, damping & controlling torque, T/W ratio, Pointers & Scales. Principles of operation of various types of electro mechanical indicating / registering instruments viz. PMMC, dynamometer, induction, thermal, etc. for dc & ac measurement of V, I, W, frequency, phase & power factor etc., energy meter, their sources of error & compensation, shunts & multipliers, multi-meter.

3. Potentiometers:

Basic Potentiometer circuit, multiple range potentiometers, constructional details of potentiometers, applications of d-c potentiometers; self balancing potentiometers. A-C potentiometers, polar and co-ordinate types.

Part B

4. Bridges:

Bridge sensitivity. Errors, , Wagner Earthing Device.

5. Magnetic Measurements:

Flux meter, B-H Curve, Hysteresis loop, Permeameters, AC Testing of Magnetic materials, Separation of iron losses, iron loss measurement by Wattmeter and Bridge methods.

6. Instrument Transformers:

Theory and construction of current and potential transformers, ratio and phase angle errors and their minimization, Characteristics of CTs. & PTs., Testing of CTS & PTS.

BOOKS RECOMMENDED
EE-352
ELECTRICAL MEASUREMENTS & INSTRUMENTATIONS LAB.

Sessional: 50
L T P
Credits : 1
0 0 2

Note: At least eight experiments to be done.

List of experiments:

1. Study of principle of operation of various types of electromechanical measuring instruments.
6. Plotting of Hysteresis loop for a magnetic material using flux meter.
7. Measurement of frequency using Wein's Bridge.
8. To study the connections and use of Current and potential transformers and to find out ratio error.
9. Determination of frequency and phase angle using CRO.
11. To find 'Q' of an inductance coil and verify its value using Q-meter.
EE- 303
Linear Circuit Analysis

External: 50
L T P
Sessional: 50
3 1 0
Credits : 3

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

PART-A

1. Methods of analyzing A.C. Circuits
   Nodal Analysis: Node voltages, matrix node equations
   Mesh Analysis: Mesh currents, matrix mesh equations
   Network Theorems: Superposition, Thevenin’s, Norton’s, Maximum Power Transfer
   (10-hours)

2. Network Topology
   Introduction, Network Graph, Tree and Co-tree, Twigs and Links, Incidence Matrices and its properties, Link currents: Tie-Set Matrix, Cut-Set and Tree Branch Voltages
   (7-hours)

3. Two-Port Networks
   Introduction, Open Circuit Impedance Parameter, Short Circuit Admittance Parameter, Transmission Parameter, Inverse Transmission Parameter, Hybrid Parameter, Interrelationship of different parameters, Inter-Connection of Two-Port Networks, Terminated Two-Port Network, T and Π representation.
   (8-hours)

PART-B

1. Laplace Transform Analysis
   Definition of Laplace Transform, Step function, Impulse function, Periodic function, Inverse transform, Initial and Final value theorem, Circuit Elements in the S-Domain,
   Transfer Functions: Circuit Analysis, Convolution and Impulse Response
   (10-hours)

2. Network Functions and s-Domain Analysis
   Complex Frequency and its Physical Interpretation, Transform Impedance and Transform Circuits, Series and Parallel Combination of Elements, Terminal Ports.
   Network Functions: Network functions for One-Port and Two-Port Networks, Poles and Zeros and their Significance, Properties and Necessary Conditions of Driving Point Functions and Transfer Functions, Routh Criteria
   (10-hours)

Text Book


Other Recommended Books

EE-353

Linear Circuit Analysis Lab

Sessional: 50
L T P
Credits : 2
0 0 3

1. To make 3-phase unbalanced network with neutral return of known impedance. Measure phase currents, neutral currents and the potential difference between the load and supply neutral. Verify the results theoretically.

2. To determine phase sequence of three phase supply system and to find the line currents for three phase three wire load when the sequence is i) RYB ii) RBY. Verify the results theoretically.

3. To study the current build up and current decay in RL / RC circuit by obtaining its response to a square wave input.

4. To check the polarity marking of a transformer and to determine self inductance of each winding and mutual inductance between the windings.

5. To study the resonance in R-L-C circuit, and to measure Q-factor of the coil.

6. To find the various two port network parameters (open circuit, short circuit, transmission and hybrid parameters)

7. For a circuit supplied from a non-sinusoidal source verify the following current and voltage relations:
   \[ V^2 = V_{dc}^2 + V_1^2 + V_2^2 + \ldots \]
   \[ I^2 = I_{dc}^2 + I_1^2 + I_2^2 + \ldots \]

8. To analyze a complex waveform.

9. To obtain capacitor voltage vs. time curve and time constant of an RC circuit when
   i) It is switched on to dc supply
   ii) Capacitor is discharged through the resistance

10. PSpice simulation of circuits to obtain steady state response for dc and ac excitation
11. PSpice simulation for transient response of circuits
12. PSpice simulation of unbalanced three phase circuits and for circuits with mutual inductance
EE – 304

SEMICONDUCTOR AND DIGITAL ELECTRONICS

External: 50
L T P
Sessional: 50
3 1 0
Credits : 3

Note: Examiner shall set eight questions four from each part. Candidate will be required to attempt any five questions selecting at least two questions from Part A and Part B.

Part-A

1. Transistor at low frequencies:
   Graphical analysis of CE configuration two port devices and hybrid model, h-parameters, comparison of amplifier configurations of circuits

2. Transistor biasing and Thermal stabilization:
   Concept of biasing & biasing of BJT circuits, Operating point, bias stability, stabilization against variation in Ico, Vbe, and β, thermal run away, thermal stability.

3. Power amplifiers:
   Classification of amplifiers, Class A large signal amplifier, second and higher harmonic distortion, transformer coupled amplifiers, Efficiency of amplifiers, Push pull amplifiers (class A & class B).

Part-B

4. Data Converters:
   Sample & Hold switch, D/A converters, weighted resistor type, R-2R Ladder type, A/D converters: Counter-Ramp type, Dual Slope type, Successive Approximation type, Specifications of ADC & DAC.

5. Digital Logic Families:
   Characteristics of digital circuits: fan in, fan-out, power dissipation, propagation delay, noise margin, Transistor-transistor logic (TTL), Manufacturer Data Sheets & Specifications, Types of TTL gates (Schottky, standard, low power, high speed), Emitter Coupled logic (ECL), Manufacturers Data Sheets & Specifications, Comparison of characteristics of TTL, ECL, Tristate Logic & its applications.

6. Semiconductor Memories & Programmable Logic:
   ROM, PROM, EPROM, EEPROM, RAM: Static RAM, Typical Memory Cell, Memory Organisation, Dynamic RAM cell, Reading & Writing Operation in RAM, PLA & FPGA.

Books Recommended:

Integrated Electronics: Millman & Halkias (Mc-Graw Hill)
Microelectronic Circuits: AS Sedra & KC Smith (OXFORD)
Electronics Devices & Circuit Theory: RL Boylestad & L Nashelsky (PHI)
Digital Electronics: Taub Schilling
Digital Logic Design: Morris Mano
Digital System Principles & Applications: R J Tocci (PHI)
Note: At least six experiments to be done.

1. To study the specification sheet & draw the characteristics of transistor in CB or CE configuration.
2. To draw the frequency response of a single stage BJT amplifier.
3. To measure the voltage and current gain of a BJT amplifier.
4. To measure the distortion in the output of a push pull amplifier.
5. To study the data sheets of TTL and ECL gates.
6. To convert 8 bit digital data to analog value using DAC.
7. To convert analog value into 8 bit digital data using ADC.
8. Verify the truth tables of/with various gates, RS, D, JK Flip Flops.

To simulate the following using P-spice

1. Frequency Response of a single state FET amplifier.
2. Voltage and current gain of BJT amplifier.
3. Distortion of a push pull power amplifier.
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PART A

Error analysis: Relative error, Absolute error, Round-off error, Truncation error, significant digits and numerical instability. (Scope as in Section 1.3, Chapter 1 of Reference 1).

(4 Lectures)

Transcendental and polynomial equations: Bisection method, Iteration Method based on first degree equation: Secant method, Regula-falsi method and Newton – Raphson methods, Rate of convergence of Secant method, Regula-Falsi method and Newton-Raphson Method. Bairestow’s method to find quadratic factor of a polynomial (Scope as in corresponding topics in Section 2.3, 2.5, 2.9 of Chapter 2 of Reference 1)

(8 Lectures)

Interpolation: Polynomial interpolation: Finite differences, Lagrange and Newton interpolation (Forward, Backward and Divided difference methods), inverse interpolation, Hermite interpolation (Scope as in corresponding topics in Section 4.1-4.3, 4.5 of Chapter 4 of Reference 1)

(10 Lectures)

PART B

Solution of Linear Systems: Gauss elimination method, Gauss-Seidel method, Cholesky’s Decomposition. Matrix inversion: Gauss-Jordan method. Eigenvalue problem: Bounds on Eigenvalues (Gerschgorin and Brauer theorems), Householder’s method for symmetric matrices, Power method (Scope as in corresponding topics in Section 3.2, 3.4, 3.6, 3.9, 3.11 of Chapter 3 of Reference 1).

(10 Lectures)

Numerical Integration: Trapezoidal Rule, Simpson’s 1/3 and 1/8 rule, Romberg integration, Newton – Coates formulae (Scope as in corresponding topics in Section 5.7, 5.8 of Chapter 5 of Reference 1).

(5 Lectures)

Numerical solutions of ordinary differential equations: Taylor’s series, Euler and Runge – Kutta methods. Finite difference methods for boundary value problems (Scope as in corresponding topics in Section 6.4 of Chapter 6 of Reference 1).

(5 Lectures)
**Functional approximation:** Chebyshev polynomials, Economization of power series, Least square approximation (Scope as in corresponding topics in Section 4.9 of Chapter 4 of Reference 1).  
(3 Lectures)

**References:**

4. James B. Scarborough. Numerical Mathematical Analysis
EE- 401

ELECTRICAL MACHINERY-II

External: 50                              L T P
Sessional: 50         3 1 0
Credits : 3

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

Synchronous Machines:
(18)


Part-B

Parallel operation of alternators:
(12)
Synchronizing to infinite Bus-Bars, synchronoscope, parallel operation of alternators, Operating characteristics, generating Machine, motoring machine, power angle characteristic, operation at constant load with variable excitation, generating Machine, motoring machines, minimum excitation, observation, compounding curve, synchronous condenser, consideration of armature resistance, power flow (transfer) equations,

Special motors:
(10)
Brushless dc motors, schematic and operation, circuit model characteristics of brushless dc motor, PM Brushless dc machine, universal motor and stepper motor, linear induction motor, Hysteresis motor, reluctance motors

Text Books:

Other Recommended Books:
1 Electrical Machinery and Transformers by Bhag S. Guru and Huseyin R. Hiziroglu,

EE- 451
ELECTRICAL MACHINERY-II LAB

Sessional: 50          L T P
Credits : 2                  0 0 3

Note: At least eight experiments are to be performed.

1. To perform no load test on a 3 phase alternator (cylindrical rotor).
2. To perform short circuit test on a 3 phase alternator (cylindrical rotor). Measure the resistance of stator winding of alternator. Find out regulation of alternator at full load at (i) unity power factor (ii) 0.85 Power factor lagging (iii) 0.85 Power factor leading using synchronous impedance method.
3. To synchronize an alternator with the 3 phase supply.
4. To perform the parallel operation of two alternators.
5. To perform the slip test to determine the Xd and Xq.
6. To run a stepper motor in different modes with the help of microprocessor.
7. To analyze the power factor improvement of an industry and design the capacitor bank.
8. Computer aided transformer design
9. Computer aided induction machine design
10. Computer aided synchronous machine design
11. To obtain positive, negative and zero sequence impedances of a three phase synchronous generator
12. To obtain positive, negative and zero sequence impedances of a three phase transformer
EE-402

CONTROL ENGINEERING

External: 50  L  T  P
Sessional: 50  3 1 0
Credits: 3

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

Introductory Concepts: Open loop and closed loop control systems, Servomechanisms, feedback and effects of feedback, linear and non-linear systems, time variant & invariant, continuous and sampled data control systems, illustrative examples.

Modelling: Mathematical models of linear electrical, mechanical, translational, rotational, gear, thermal, pneumatic and hydraulic systems, electrical and mechanical analogies. Laplace transforms Transfer function, Block diagram representation, signal flow graphs and associated algebra, characteristics equation.

State Space Analysis: Concepts of state variable, state vector and state space, State space representation, solution of state equation for LTI and LTV systems, state transition matrix.

Time Domain Analysis: Typical test-input signals, Transient response of the first and second order systems. Time domain specifications, Dominant closed loop poles of higher order systems. Steady state error and error co-efficient,


Part-B

Root Locus Technique: The extreme points of the root loci for positive gain. Asymptotes to the loci, Breakaway points, intersection with imaginary axis, location of roots with given gain & sketch of the root locus plot.. Rules for construction of root locus, root contours, root sensitivity, generalized root locus.


Control Components: Error detectors- potentiometers and synchros, a.c. and d.c. servo motors, brushless d.c. motors, A.C. and D.C. techogenerators, stepper motors.
RECOMMENDED BOOKS:

EE-452

CONTROL ENGINEERING LAB.

Sessional: 50                                      L T P
Credits : 2                                      0 0 3

Note: At least eight experiments are to be performed.

1. To study the input-output characteristics of a potentiometer and to use a potentiometer as an error detector.
2. To study transmitter - receiver characteristics of a synchros set and to use the set as control component.
3. To study the operation of d.c. position control system.
4. To study the operation of d.c. speed control system.
5. To design different compensating networks for the given cut off frequency response.
6. To study PID controller and to obtain the effect of proportional, Integral and derivative control action.
7. To study the MATLAB Programming for controls systems related to steady state and transfer function conversions.
8. To obtain the step and ramp input response for the various transfer functions using MATLAB.
9. To obtain the root locus response for different systems using MATLAB.
10. To obtain response of basic control system problems in SIMULINK and tune them in MATLAB.
11. To run and use SIMULINK based models in MATLAB. To analyze and simulate the models of following real time applications in MATLAB:
12. Missile System.
13. Sun-seeker System
EE-403

POWER SYSTEMS-I

External: 50          L T P
Sessional: 50          3 1 0
Credits : 3

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

1. Introduction
   Introduction to Power System, Representation of power system components, One line diagram and impedance diagram, Per unit system, Complex power. (4-hours)

2. Transmission-Line Parameters
   Resistance, Conductance, Inductance: Solid Cylindrical Conductor, Inductance: Single-Phase Two-Wire Line and Three-Phase Three-Wire Line with Equal Phase Spacing, Composite Conductors, Unequal Phase Spacing, Bundled Conductors, Series Impedances: Three-Phase Line with Neutral Conductors and Earth Return, Electric Field and Voltage: Solid Cylindrical Conductor
   Capacitance: Single-Phase Two-Wire Line and Three-Phase Three-Wire Line with Equal Phase Spacing, Stranded Conductors, Unequal Phase Spacing, Bundled Conductors
   Shunt Admittances: Lines with Neutral Conductors and Earth Return
   Electric Field Strength at Conductor Surfaces and at Ground Level
   Parallel Circuit Three-Phase Lines

3. Transmission Lines: Steady-State Operation
   [Glover-Sarma: 5.1-5.7] (8-hours)

Part-B

4. Symmetrical Faults
   Three-Phase Short Circuit--Unloaded Synchronous Machine, Power System Three-Phase Short Circuits, Bus Impedance Matrix and its formation.
   [Glover-Sarma: 7.1-7.5] (8-hours)

5. Symmetrical Components
   Definition of Symmetrical Components, Sequence Networks of Impedance Loads, Sequence Networks of Series Impedances, Sequence Networks of Three-Phase Lines, Sequence Networks of Rotating Machines, Per-Unit Sequence Models of Three-Phase Two-Winding Transformers, Per-Unit Sequence Models of Three-Phase Three-Winding Transformers, Power in Sequence Networks
   [Glover-Sarma: 8.1-8.8] (6-hours)

6. Unsymmetrical Faults
   [Glover-Sarma: 9.1-9.5] (8-hours)

Text Book
Other Recommended Books

Design/analysis projects relating to the following.

1. Determination of line parameters and sequence impedances of transmission lines.
2. Line loadability.
3. Steady state operation of transmission lines.
4. Symmetrical and Unsymmetrical power system faults.
EE-404
ANALOG ELECTRONICS

External: 50          L T P
Sessional: 50          3 1 0
Credits : 3

Note: Examiner shall set eight questions four from each part. Candidate will be required to attempt any five questions selecting at least two questions from Part A and Part B.

Part-A

TRANSISTOR AND FET AMPLIFIERS


FEEDBACK AMPLIFIERS AND OSCILLATORS

Concept of feedback, Classification of feedback amplifiers, General characteristics of negative feedback amplifiers, Effect of Feedback on Amplifier characteristics, Ideal feedback topologies, Voltage series, current series, voltage shunt, current shunt feedback circuits and their analysis, Oscillator, Condition of oscillations, Types of oscillator: RC Phase Shift, Wein Bridge, Hartley, Colpitts and Crystal Oscillators.

ACTIVE FILTER & TUNED AMPLIFIERS

Advantages of active filters, classification of filters, response characteristics of butter worth, chebyshev and causal filters, first and second order low pass high pass, band pass and band stop filters. Tuned Amplifiers: single tuned, double tuned and stagger tuned amplifiers and their analysis

Part-B

OPERATIONAL AMPLIFIER & ITS APPLICATION

Differential Amplifier, Block diagram representation of a typical Op-amp, Ideal Op-amp characteristics, equivalent circuit of Op-amp, open loop op-amp configuration, practical Op-amp, Input Offset voltage, Bias and offset currents, compensation, frequency response, CMRR, Supply voltage rejection ration (SVRR), Slew Rate, application of Op-amp Inverting and non inverting mode, differential mode, instrumentation amplifiers, comparator, Schmitt trigger, Clippers and Clampers, Sample and Hold Circuit, logarithmic amplifiers, Summer, Integrator and Differentiator

PULSE CIRCUITS

RC circuit as integrator and differentiator, Switching characteristics of a BJT, Astable, monostable and bistable multivibrators, Multivibrators with 555 IC timer, Schmitt Trigger Circuits, voltage and current time base generators, Miller & bootstrap sweep generator

Book recommended
EE - 454
ANALOG ELECTRONICS LAB

Sessional: 50
Credits: 1

L T P: 0 0 2

Note: At least eight experiments to be done.

1. To study the phase shift oscillator and find its frequency.

2. To study the frequency of a given crystal oscillator and measure the output.

3. To study WEIN-BRIDGE oscillator and determine its frequency.

4. To study voltage gain and frequency response of FET audio power amplifier.

5. To study the two stage RC coupled transistor amplifier.

6. To study the series and shunt feedback amplifiers and determine it frequency and i/p & o/p impedence.

7. To study the frequency response of Tuned Amplifier.

8. To study the Pspice Simulation software.

9. To study the frequency response of OP-Amp & simulate using P-spice.

10. To design Butter worth Low pass filter, High pass filter & simulate using P-spice.
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EE- 511
Power Systems-II

L T P
3 1 0

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

1. Power System Protection
   Power System Overvoltages, protection against over voltages by shielding or ground wires and lightning arrestors, insulation coordination. (13h)

2. Circuit Breakers
   Transient recovery voltage, resistance switching, first pole to clear factor. Transient recovery voltage, arc and arc extinction, volt ampere characteristics of arc, methods of arc extinction, construction, working and applications of air-break circuit breakers, oil circuit breakers, vacuum circuit breakers, air blast circuit breakers, SF6 circuit breaker ratings. (10 h)

PART-B

3. Substations and Distribution
   Location and types of substations, bus-bar arrangements, major substation equipment
   Types of insulators, voltage distribution across suspension insulators, string efficiency, methods of improving string efficiency
   Types of Underground cables, capacitance of single core cables, grading of cables, capacitance of three core belted cables, power factor and heating of cables
   Radial, parallel or loop, network or grid types of distribution systems and their relative merit. (10 h)

4. Grounding
   Grounding fundamentals, Ground resistance, step voltage, touch voltage and transferred voltage, tolerable step and touch voltages, ground resistance of a hemisphere and driven rod, IEEE Standard 80 formulæ for ground resistance and step and mesh voltages of a grounding grids, limitations of the formulæ.
   Neutral grounding: ungrounded systems, resonant grounding, solid or effective grounding, reactance grounding, earthing transformer, neutral grounding practice. (8 h)

Text Book / Standards


Other Recommended Books

EE- 561
POWER SYSTEMS II LAB

Note: At least eight experiments / projects / technical reports relating to the following:

1. Measurement of soil resistivity and soil model evaluation
3. Grounding system design for a substation.
4. To study the characteristics of over current relay.
5. To study the characteristics of percentage differential relay.
6. To study the characteristics of distance relay.
7. To study current time characteristics of fuses.
8. Technical visit to a substation/generating station, Load Dispatch Centre and preparation of a technical report for the same
9. Conventional and renewable energy sources
10. Distribution system design
11. Digital relaying
12. Reactive compensation of lines
EE-512

ELECTRICAL MACHINERY-II

L T P
3 1 0

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

Synchronous Machines: (18)


Part-B

Parallel operation of alternators: (12)

Synchronizing to infinite Bus-Bars, synchronoscope, parallel operation of alternators, Operating characteristics, generating Machine, motoring machine, power angle characteristic, operation at constant load with variable excitation, generating Machine, motoring machines, minimum excitation, observation, compounding curve, synchronous condenser, consideration of armature resistance, power flow (transfer) equations,

Special motors: (10)

Brushless dc motors, schematic and operation, circuit model characteristics of brushless dc motor, PM Brushless dc machine, universal motor and stepper motor, linear induction motor, Hysteresis motor, reluctance motors
Text Books:


Other Recommended Books:

1. Electrical Machinery and Transformers by Bhag S. Guru and Huseyin R. Hiziroglu, New York Oxford University Press 2004

EE-562

ELECTRICAL MACHINERY-II LAB

L T P
0 0 3

External: 25
Sessional: 50

Note: At least eight experiments are to be performed.

13. To perform no load test on a 3 phase alternator (cylindrical rotor).
14. To perform short circuit test on a 3 phase alternator (cylindrical rotor). Measure the resistance of stator winding of alternator. Find out regulation of alternator at full load at (i) unity power factor (ii) 0.85 Power factor lagging (iii) 0.85 Power factor leading using synchronous impedance method.
15. To synchronize an alternator with the 3 phase supply.
16. To perform the parallel operation of two alternators.
17. To perform the slip test to determine the Xd and Xq.
18. To run a stepper motor in different modes with the help of microprocessor.
19. To analyze the power factor improvement of an industry and design the capacitor bank.
20. Computer aided transformer design
21. Computer aided induction machine design
22. Computer aided synchronous machine design
23. To obtain positive, negative and zero sequence impedances of a three phase synchronous generator
24. To obtain positive, negative and zero sequence impedances of a three phase transformer
EE-513

Microprocessors and Interfacing

L T P
3 1 0

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

Microprocessor Architecture and Microcomputer Systems: Microprocessor Architecture Memory, Input and Output Devices, The 8085 MPU, Example of an 8085-Based Microcomputer, Memory Interfacing. (4 h)


Programming Techniques: Looping, Counting and Indexing, Additional Data Transfer and 16-Bit Arithmetic Instructions, Arithmetic Operations Related to Memory, Logic Operations. (4 h)

Part-B

Counters and Time Delays: Counters and Time Delays, Hexadecimal Counter, Modulo Ten, Counter, Generating Pulse Waveforms, Debugging Counter and Time-Delay Programs. (4 h)

Stack and Subroutines: Stack, Subroutine, Conditional Call and Return Instructions. (2 h)

Interrupts: The 8085 Interrupt, 8085 Vectored interrupts. (2 h)

Interfacing Data Converters: Digital-to-Analog (D/A) Converters, Analog-to-Digital (A/D) Converters, stepper motor interfacing (4 h)

General–Purpose Programmable Peripheral Devices: The 8255A Programmable Peripheral Interface, Illustration: Interfacing Keyboard and Seven-Segment Display, Illustration: Bi-directional Data Transfer between Two Microcomputers, The 8254 Programmable Interval Timer, The 8259A Programmable Interrupt Controller, Direct Memory Access (DMA) and the 8257 DMA Controller, serial communication, Programmable communications interface 8251, RS 232C. (6 h)

TEXT BOOK
Ramesh S. Gaonkar, "Microprocessor Architecture, Programming and Applications with the 8085"

OTHER RECOMMENDED BOOKS:

Charles M. Gilmore, “Microprocessor Principles and Applications”, TMH.
Douglas V. Hall, “Microprocessors and Interfacing programming and Hardware” TMH.
1. Study of 8085 Microprocessor kit
2. Write Assembly Language Program to add n given numbers with and without carry.
3. Write Assembly Language Program to count positive & negative numbers in given n numbers.
4. Write Assembly Language Program to de-assemble 8- bit number in two nibbles.
5. Write Assembly Language Program to reassemble two nibbles in 8- bit number.
6. Write Assembly Language Program to sort given n numbers in ascending & descending order using subroutine.
7. Write Assembly Language Program to relocate the given numbers in same & reverse order.
8. Write Assembly Language Program to Flash different letters using your own delay subroutine.

Interfacing of Microprocessor 8085:

1. To obtain a square wave on CRO
2. To interface A to D converter
3. To interface D to A converter
4. To interface input/output module for complementing the input data.
5. To interface stepper motor with μP to control its step size and direction of rotation
6. To develop a traffic light controller program and interface using Input/Output Module.
EE- 514
Instrumentation systems

L T P
3 1 0

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

PART-A

1) Transducers & Standards
Standards of Instrumentation Systems and Their Classification: Emf, Current, Resistance and Capacitance Standards. Sensors and Transducers: Primary Sensing Elements; Characteristics; Classification.
Passive-Transducers-Resistive, Inductive, Capacitive; Types, Features, Configurations, Analysis, Applications.
Active Transducers- Thermoelectric, Electromagnetic, Piezo-Electric, Photoelectric; Types- Principle, Construction, Analysis and Applications.

2) Digital - Analog Instruments and Recording Systems

PART-B

3) Signal Conditioning:
Analog Conditioning- Instrumentation and Logarithmic Amplifiers.
Types-Analog/Digital, Block Diagram, Operation, Comparative Performance
(Data Display and Recording Devices: Principle, Operation and Use of -LEDs, LCDs, Recorders-Paper Chart, Magnetic Tape, Semi-Conductor;

4) Virtual Instrumentation
Introduction to lab VIEW Front Panel, Block Diagram, Tools And Palettes, Menus, Code Debugging, Creating Sub-Vis, For Loop, While Loop, Structures, Arrays And Clusters, Graphs And Charts, File Input And Output , Data acquisition and applications.

TEXT-BOOK
1. W.D. Cooper and A.D. Hilfrick: Electronic Instrumentation & Measurement Techniques, PHI.
2. A.K Sahnwey “Electronic and Electrical Instrumentation”.
3. R.H.Bishop, Learning with LabVIEW 7 Express,Pearson Education, Delhi.

References:
1. Murthy, D.V.S. - Transducers Instrumentation
EE- 564
Instrumentation systems Lab

External: 25
Sessional: 50

Note: At least eight experiments are to be performed.

1) Displacement measurement using LVDT
2) To study the operation of Instrumentation Amplifier.
3) Measurement of flow using electromagnetic and positive displacement parameters.
4) Measurement of level using capacitance probe differential pressure transducer.
5) Design of linearization circuit for thermistor.
6) Experiments based on Lab VIEW.

CSE-511
COMPUTER NETWORKS

External: 100
Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

Introduction (6)
Data Transmission concepts; switching; Modulation; multiplexing; Network Hardware: LAN, MAN, WAN, Wireless Networks, Internet works; Network Software: Layer, Protocols, interfaces and services; Reference Model: OSI, TCP/IP and their comparison.

Physical Layer (10)

Data Link Layer (10)
Framing; Error control; Error Correction & Error Detection; Sliding window protocols; Examples of DLL Protocols – HDLC,SLIP, PPP ; Medium Access Sub Layer: Channel Allocation, MAC protocols – ALOHA,CSMA protocols, Collision free protocols, Limited Contention Protocols , Wireless Protocols , IEEE 802.3,802.4,802.5 standards and their comparison. Bridges: Transparent, source routing, remote.

Part-B

Network Layer (8)
Design issues, routing algorithms (shortest path, flooding, flow based, distance vector, hierarchical, broadcast, multicast, for mobile host). Introduction to Congestion control algorithms.

Transport Layer (5)
Addressing, establishing and releasing connection, flow control & buffering, multiplexing, crash recovery, Internet Transport protocol (TCP and UDP).

Application Layer (6)
Basics of Network security, Domain Name System, Introduction of Simple Network Management Protocol, Electronic mail and FTP.

Text Books
1. Computer Networks Andrew S. Tanenbaum (PHI)
2. Data Communications and Networking, 3/e Behrouz A Forouzan (Mcgraw-hill)

Other Recommended Books
1. Data and Communication William Stallings (PHI)
2. Data & Computer Communication Douglos E. Coomer (Addison Wessl)
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EE- 611
CONTROL ENGINEERING

L T P
3 1 0

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

Introductory Concepts: Open loop and closed loop control systems, Servomechanisms, feedback and effects of feedback, linear and non-linear systems, time variant & invariant, continuous and sampled data control systems, illustrative examples.

Modelling: Mathematical models of linear electrical, mechanical, translational, rotational, gear, thermal, pneumatic and hydraulic systems, electrical and mechanical analogies. Laplace transforms, Transfer function, Block diagram representation, signal flow graphs and associated algebra, characteristics equation.

State Space Analysis: Concepts of state variable, state vector and state space, State space representation, solution of state equation for LTI and LTV systems, state transition matrix.

Time Domain Analysis: Typical test-input signals, Transient response of the first and second order systems. Time domain specifications, Dominant closed loop poles of higher order systems. Steady state error and error co-efficient,


Part-B

Root Locus Technique: The extreme points of the root loci for positive gain. Asymptotes to the loci, Breakaway points, intersection with imaginary axis, location of roots with given gain & sketch of the root locus plot.. Rules for construction of root locus, root contours, root sensitivity, generalized root locus.

**Control Components:** Error detectors- potentiometers and synchros, a.c. and d.c. servo motors, brushless d.c. motors, A.C. and D.C. techogenerators, stepper motors.

**RECOMMENDED BOOKS:**

Control System Engineering by I.J. Nagrath & Gopal, New Age International (P) Limited, New Delhi, 3rd edition, 2004


EE-661
CONTROL ENGINEERING LAB.

L T P
0 0 3

External: 25
Sessional: 50

Note: At least eight experiments are to be performed.

15. To study the input-output characteristics of a potentiometer and to use a potentiometer as an error detector.
16. To study transmitter - receiver characteristics of a synchros set and to use the set as control component.
17. To study the operation of d.c. position control system.
18. To study the operation of d.c. speed control system.
19. To design different compensating networks for the given cut off frequency response.
20. To study PID controller and to obtain the effect of proportional, Integral and derivative control action.
21. To study the MATLAB Programming for controls systems related to steady state and transfer function conversions.
22. To obtain the step and ramp input response for the various transfer functions using MATLAB.
23. To obtain the root locus response for different systems using MATLAB.
24. To obtain response of basic control system problems in SIMULINK and tune them in MATLAB.
25. To run and use SIMULINK based models in MATLAB. To analyze and simulate the models of following real time applications in MATLAB:
   27. Sun-seeker System
EE- 612

POWER ELECTRONICS AND DRIVES

L T P
3 1 0

External: 100

Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

Thyristor and Semiconductor Power Switching Devices

Devices of Thyristor family and their V-I characteristics: Thyristor, Diac, Triac, GTO, MOSFET, IGBT. Principle of operation of SCR. Turn on methods of a Thyristor, Switching characteristics of Thyristor during turn-on and turn-off, Gate characteristics, Thyristor triggering and commutation circuits

Series and parallel operation of SCR’s, Thyristor specifications (latching current and holding current, dv/dt and di/dt etc.), Thyristor Protection circuits, UJT: characteristics and as a relaxation oscillator.

Phase controlled Rectifiers


Inverters

Single-phase and three phase inverters, 180-degree and 120-degree conduction, PWM inverters, Series and parallel inverters, Mc-Murray Bedford inverters.

Choppers

Principle of chopper operations, Control strategies, types of chopper (A, B, C, D, and E), and voltage commutated chopper or classical Jones chopper, Morgan chopper.

Part-B

Cycloconverters

Single phase bridge cycloconverter. Three phase to single phase, single phase to single phase cycloconverter. Advantages disadvantages of cycloconverter.

D C and A C Drives

FACTS Technology, objectives, types of controllers, FACTS Devices: STATCOM, SSG, SVG, UPFC and SSSC.

Text Books


Other Recommended Books

Mohammed H. Rashid, power Electronics- circuits, Devices and applications, PHI New Delhi, 2001


Vedam Subrahmanyam, “Thyristor Control of Electric Drives”, New Delhi, 1998
1. To plot the V-I characteristics of the SCR.

2. To draw V-I characteristics of Triac.

3. Study of SCR triggering circuits and check the performance of UJT as triggering device.

4. Study of SCR commutation circuits and check the performance of one commutation circuit.

5. Study of Jones chopper or any chopper circuit to check the performance.


7. Speed Control of induction motor using Thyristor.

8. Study of series inverter and Mc Murray half-bridge inverter and check their performance.


10. Design and simulation of following Thyristor circuits using PSCAD / MATLAB software.

   i. commutation,
   ii. chopper,
   iii. invertors,
   iv. rectifier
   v. UJT as triggering circuit
   vi. Speed control of motors.
EE- 613

Computer Aided Power Systems Analysis

L T P

3 1 0

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

1. Power Flow Studies


2. Power System Controls

Generator-Voltage Control, Turbine-Governor Control, Load-Frequency Control (single area and two area case), Economic Dispatch, Introduction to Optimal Power Flow. 10h

Part- B

3. Transient Stability Studies

Introduction of power system stability, The Swing Equation, Simplified Synchronous Machine Model and System Equivalents, Stead state stability, Transient stability, The Equal-Area Criterion for sudden change in mechanical input, sudden loss of one parallel lines, sudden short circuit on one parallel lines and effect of clearing time on stability, Numerical Integration of the Swing Equation, Design Methods for Improving Transient Stability. 18 h

Text Book


Other Recommended Books

EE- 663

Computer Aided Power Systems

Analysis Laboratory

L T P
0 0 3

External: 25

Sessional: 50

Note: At least four design / analysis projects relating to the following.

5. Power flow analysis.
6. Power flow control
7. Economic dispatch
8. Transient stability studies.
9. Load frequency control
EE -614
Microcontroller, PLCs and Applications

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

Introduction: Micro controller, Comparison of Microprocessor and Micro controller, micro controller and embedded processors. 2 h

The 8051 Architecture: 8051 Micro controller hardware, Input/Output Pins, Ports, and Circuits, External memory, Counter & timers, Serial Data Input/Output, Interrupts 6 h

8051 Assembly Language Programming: Introduction to 8051 Assembly programming, Assembling and running an 8051 program. Data Types and directives. Addressing modes and accessing memory using various addressing modes. Arithmetic instructions and programs, Logic instructions and programs, Single bit instructions and programming, Jump loop and call instructions, I/O Port programming, Timer/counter programming in the 8051 8 h

Serial Communication: 8051 connection to RS 232, 8051 serial communication Programming. 3 h

Part-B

Real World Interfacing: LCD, ADC and sensors, Stepper motor, keyboard, DAC and external memory 7 h

Introduction to PLC: Introduction to Process Control & Automation, PLC as a Computer, PLC CPU, Solid State Memory, CPU Processor, I/O Modules, PLC-Advantages & Disadvantages. 5 h

General PLC programming: Introduction, Programming Equipment, Program Format, Construction of Ladder Diagrams 4 h
Programming ON-OFF Inputs to produce ON-OFF Outputs: PLC Input Instructions, Outputs Coil Indicators & others, Operational procedures, Contact & Coil Input/Output Programming Examples, Industrial Process Example. 5 h

Recommended Books:

The 8051 Microcontroller Architecture, Programming & application, by Ayala

The 8051 Microcontroller and embedded Systems by: Ali Mazidi

An embedded software primer, David e Simon, Pearson Education

Programmable logic controllers Principles & applications, John W. Webb, Prentice Hall
EE-664
Micro Controller, PLCs and Applications Lab

List of Experiments:

Note: At least eight experiments to be done selecting at least two from the last experiment.

1. Study of 8051/8031 Micro controller kits.
2. Write a program to add two numbers lying at two memory locations and display the result.
3. Write a program for multiplication of two numbers lying at memory location and display the result.
4. Write a program to check a number for being ODD or EVEN and show the result on display.
5. Write a program to split a byte in two nibbles and show the two nibbles on display.
6. Write a Program to arrange 10 numbers stored in memory location in Ascending and Descending order.
7. Write a program to find a factorial of a given number.
8. Write a program to show the use of INT0 and INT1.
9. Write a program of Flashing LED connected to port 1 of the Micro Controller
10. Write a program to generate a Ramp waveform using DAC with micro controller.
11. Write a program to interface the ADC.
12. Write a program to control a stepper motor in direction, speed and number of steps.

Write Ladder programs (at least two) using PLC for control of simple industrial Processes.
EC- 611
ELECTRONIC SYSTEMS DESIGN

L T P
3 1 0

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A
COMBINATIONAL CIRCUITS (17)
Error Correction and Detection: Error detection and correction techniques, Single error detection, Single error correction with double error
VHDL models and simulation of combinational circuits such as Multiplexers, Encoders, Decoders, Code converters, Comparators, Implementation of Boolean functions etc.

PART-B

FAULTS (05)
Fault detection and Location in combinational circuits: Different methods of detecting and locating Faults in combinational circuits.

SEQUENTIAL CIRCUITS (18)
VHDL Models and simulation of sequential circuits, Shift registers, Counters etc.

FAULTS (05)
Fault detection and Location in sequential circuits.

TEXT BOOKS
Digital circuits and Logic Design By Lee
Switching and Finite Automata Theory, Kohavi
A VHDL Primer, Bhasker; Prentice Hall

OTHER RECOMMENDED BOOKS
Computer Logic Design, Morris Mano
Switching circuits for Engineers, Marcus
Introduction to Digital systems, James Palmier, David Perlman
Digital System Design using VHDL, Charles. H. Roth; PWS


VHDL-IV Edition Perry; TMH

Fundamentals of Digital Logic with VHDL Design: Brown and Vranesic;

TMH
EC -661
ELECTRONIC SYSTEMS DESIGN LAB

L T P
0 0 3

External: 25
Sessional: 50

Note: At least eight experiments are to be performed.

List of Experiments:

1. To Design and test the minimized circuit of Full Adder.
2. To Design and test the minimized circuit of BCD to Binary Converter
3. Implement decade counter using minimum number of gates
4. To test the minimized circuit of Decimal to BCD Encoder
5. Design and test hexadecimal to binary Encoder
6. Implement and test BCD TO 7-Segment decoder
7. Design a sequence detector to detect a given sequence
8. Design and test twisted type ring counter
9. Implement the minimized circuit of Modulo-6 counter
10. To design, implement and test a 16:4 multiplexer using logic gates.
11. To design, implement and test a 4:16 demultiplexer using logic gates.
12. Design & test Johnson Counter.
### BACHELOR OF ENGINEERING (ELECTRICAL & ELECTRONICS)

#### VII SEMESTER

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**Elective I (Theory & Practical) - One of the following subjects:**

(a) Wireless Communications

(b) Optical Communications
EE-711
NON – CONVENTIONAL ENERGY SOURCES

L T P
3 1 0

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A
INTRODUCTION: Limitation of conventional energy sources, need and growth of alternative energy source, basic scheme and application of direct energy conservation.

MHD GENERATORS: Basic principles, gaseous, conduction and hall effect, generator and motor effect, different types of MHD generator, types of MHD material, conversion effectiveness, analysis of constant area MHD generator, practical MHD generator, application and economic aspects.

THERMO-ELECTRIC GENERATORS: Thermoelectric effects, Seebeck effect, Peltier effect, Thomson effect, thermoelectric converters, figures of merit, properties of thermoelectric material, brief description of the construction of thermoelectric generators, application and economic aspect.

PHOTO VOLTAIC EFFECT AND SOLAR ENERGY: Photovoltaic effect, different types of photovoltaic cells, cell fabrication, characteristics of photovoltaic cells, conversion efficiency, solar batteries, application, solar radiation analysis, solar energy in India, solar collectors, solar furnaces and applications.

Part-B
FUEL CELLS: Principle of action, Gibb's free energy, general description of fuel cells, types, construction, operational characteristics and application.

MISCELLANEOUS SOURCES: Geothermal system, characteristic of geothermal resources, choice of generator set, electric equipment precautions low hydro-plants, definition of low head hydrometer, choice of site, choice of turbine wind power, history of wind power, wind machines, theory of wind power, characteristic of suitable wind power site, tidal energy, idea of tidal energy, tidal electric generator.

Recommended Books:
EC 711 (a)  
Wireless Communication

External: 100  
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Course duration: 45 lectures of one hour duration each.

Part-A

Introduction

Evolution of Mobile Communication Systems, Paging systems, cordless telephone systems, cellular telephone systems, comparison of common wireless communication systems, 2G cellular networks, 2.5 G wireless network, HSCSD, GPRS, EDGE technology, 3G wireless network, UMTS, 3G CDMA2000, 3G TD-SCDMA, Wireless Local Loop, Blue tooth and Personal Area Networks

Cellular System Design Fundamentals

Frequency reuse, Channel alignment strategies, handoff strategies, interference and system capacity, Near for problems, power control, improving coverage and capacity in cellular systems, parameters for mobile multipath channel, Small scale fading.

Part-B

Modulation Techniques

Amplitude Modulation, Angle modulation, Digital Modulation, Spread Spectrum Modulation techniques

Part-B

Diversity Techniques for Mobile Radio Systems

Dispersive channels, space diversity, frequency diversity, Polarization diversity, Hybrid and quadruple diversity, RAKE receiver, Equalizer techniques. Fundamentals of channels coding.

Overview of Multiple Access Techniques

Simplex, Duplex TDD and Time Division Duplex, Time Division Multiple Access(TDMA), FDMA and OFDM, CDMA, Hybrid multiple access, Management of voice, Data and Video(Multimedia) information
Wireless Networking

Difference between wireless and fixed telephone networks, ISDN, Development of wireless networks. 

(04)

Wireless Systems

GSM, GSM Architecture, CDMA Digital cellular standard, IS-95 system. 

(06)

Books Recommended:


EC-761(a)

Wireless Communication Lab.

L T P

0 0 2

External: 25

Sessional: 50

Practicals related to Theory.
Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Course duration: 45 lectures of one hour duration each

Part-A

Overview Of Optical Fibre Communication:
Elements of basic communication system, communication system architecture and advantages of optical communication. (02)

Optical fibre wave guides, transmission characteristics and fabrication techniques:
Ray Theory of Transmission, Electromagnetic mode theory for optical communication of both types of fibers viz step index fiber and graded index fibers Attenuation, Material absorption losses, linear and non linear scattering losses, fiber bend loss, dispersion viz intermodal dispersion and intramodal dispersion, overall fiber dispersion and polarization
Preparation of optical fiber: liquid-phase techniques, vapor phase deposition techniques. (12)

Couplers And Connectors:
Connector Principles, Fiber End Preparation, splices, connectors (03)

Optical Fiber Sensors:
Intensity modulated sensor - general features, intensity modulation through light interruption, shutter multimode fiber sensors and reflective fiber optic sensors. (06)

Part-B
Optical Sources And Detectors:

Sources: Basic principle of surface emitter LED and edge emitter LED - material used, structure, internal quantum efficiency and characteristics, LASER Diode - material used, structure, internal quantum efficiency and characteristics, working Principle and characteristics of Distributed feedback (DFB) laser. Detectors: PIN photodiode - material used, working principle & characteristics, Avalanche Photodiode: - material used, working principle and characteristics.

Optical Fiber Measurements:

Total Fiber attenuation measurement using cut back technique, dispersion measurement in frequency and time domain, fiber refractive index profile measurement using interferometric methods, Numerical Aperture measurement and fiber diameter measurement.

Books Recommended:

List of Experiments:

1. To determine the Numerical aperture of a given fibre & losses in optical fibre.
2. To determine the V-parameter, the core radius & core cladding dielectric constant difference of a step index single mode fibre.
3. To measure the cut of the wavelength of a single fibre.
4. To study fibre optical analog link
5. To study fibre optical digital link
6. To study the effect of EMI/RFI on a fibre medium.
7. To setup the multiplexer & observe the simultaneous transmission of several channels on fibre optical links.
8. To study Manchester coding/decoding of fibre optical link.
9. To study LASER communication system
10. Use the connectorisation/kit/splicing kit
11. To study the following instruments
    (a) Fibre optical power meter
    (b) Fibre optical power source
12. To study optical fibre system using laser
13. To study bending losses in OFC.
External: 100

Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Course Duration: 45 Lectures of one hour each.

Part-A

Amplitude Modulation & Demodulation and Systems


(15)

Frequency Modulation

Principles and generation of FM and PM signals, Reactance Modulator method, Armstrong Method, noise consideration in FM and PM system.

(07)

Part-B

Frequency Demodulation and Systems

detection of FM and PM signals, Foster Discriminator, ratio and PLL detectors, FM Transmitter(Block Diagram), FM receiver (Block Diagram), Pre-emphasis and de-emphasis circuit.

(08)

(15)

Pulse Modulation & Demodulation

Principles, generation and detection of PAM, PWM, PPM & PCM signals, noise in pulse modulation system, band width consideration, companding, delta modulation, adaptive delta modulation systems. TDM & FDM
Books Recommended:


List of experiments:

1. To measure the modulation index of AM signals using the trapezoidal method
2. To study DSB/ SC AM signal and its demodulation using product Detector Circuit.
3. To study the voltages and waveforms of various stages of super-heterodyne receiver
4. To measure the sensitivity and selectivity of a super heterodyne radio receiver
5. To study the voltages and waveforms of various stages of FM Receiver
6. To study the pulse code modulation and de-modulation circuit
7. To study the Time division multiplexing and demultiplexing circuit
8. To study delta modulation and demodulation circuits.
9. To study sigma delta modulation and demodulation circuits.
EC-713
Digital Signal Processing

L T P
3 1 0

External: 100
Sessional: 50

Course duration: 45 lecturers of one hour duration each

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

PART A

CONTINUOUS TIME SIGNALS (04)
Review of Fourier series and Fourier Transform, Sampling of Continuous Time signals.
DISCRETE TIME SIGNALS
Discrete time Signals & Systems, Linear Time Invariant systems, Stability and Causality, Solution of Linear constant coefficient difference equations, Convolution, Correlation, Z- Transform and its properties, Inverse Z transform.

FREQUENCY DOMAIN REPRESENTATION OF SIGNALS & SYSTEMS

PART B

DIGITAL FILTERS
Ideal Filter vs. Practical Filters, General Specifications and Design Steps, Comparison of FIR & IIR Filters.
Design of FIR Filters: Window technique, Frequency sampling technique.
Design of IIR Filters: Impulse Invariance technique, Bilinear Transformation, Design of IIR Filters using Butterworth, Chebyshev and Elliptic filter, Digital frequency transformation.

IMPLEMENTATION OF DISCRETE TIME SYSTEMS
Block diagrams and signal flow graphs for FIR and IIR systems. Direct form, Cascade and Frequency Sampling Structures for FIR systems, Direct forms, Cascade and Parallel form realization of IIR systems, Finite Word Length Effects.

DSP PROCESSORS
Introduction to fixed point and floating point processors and their architecture, TMS320C5X Architecture, Memory, Addressing Modes, Interrupts and Assembly Language Programming

Recommended Books:
2. “Digital Signal Processing” by E C Ifeacher and B W Jervis
List of Experiments:

1. Generating & Plotting Discrete time signals using MATLAB.
2. Use of basic multi-signal processing signals of MATLAB.
3. To perform different operations - addition, multiplication, scaling, folding, and shifting using MATLAB.
4. Convolution of Causal & Non Causal sequences in MATLAB.
5. Auto & Cross-Correlation in MATLAB.
7. DFT & IDFT of two sequences.
8. FFT of two Sequences.
9. FIR Filter Design using Window Method in MATLAB.
10. IIR Filter Design using Bilinear Transformation in MATLAB.
11. IIR Filter Design using Impulse Invariance in MATLAB.
12. Butterworth and Chebyshev Digital IIR Filters in MATLAB.
13. Implementation of Filter Structures in MATLAB.
15. System Design based on DSP kits.
# Bachelor of Engineering (Electrical & Electronics)

## VIII Semester

## Option I

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Elective II (Theory & Practical)- one of the following subjects:
A student can exercise option I and Option II according to the following:

A student may opt for one semester training in lieu of subjects of 8th Semester. The marks for six months training will be equal to the total marks of 8th Semester study. A student can opt for six semester training under following conditions:

a) The student got selected for job in campus placement and the employer is willing to take that student for the training.

b) The student got offer of pursuing training from reputed government research organization/govt. sponsored projects/govt. research institution provided that student should not be paying any money to get trained. For pursuing this training student needs the prior approval from the Chairperson/Coordinator of the respective branch.
EE-801

ELECTRIC POWER GENERATION

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

1. Introduction:
   Electrical energy sources, organization of power sector in India, single line diagram of thermal, hydro and nuclear power stations.

2. Loads and Load curves:
   Maximum demand, Group diversity factor, Peak diversity factor, Types of load, chronological load curves, load-duration Curve, mass curves, load factor, capacity factor, utilization factor, base load and peak load plants, load forecasting.

3. Power Plant Economics:
   Capital cost of plants, annual fixed cost, operating costs and effect of load factor on cost of energy, depreciation.

4. Tariffs and power factor improvement:

Part-B

5. Selection of plant:
   Plant location, plant size, no. and size of units in plants, economic comparison of alternatives, annual cost, rate of return, present worth and capitalized cost methods.

6. Economic operation of steam plants:
   Methods of loading turbo-generators, input- output curve, heat rate, incremental cost, method of lagrangian multiplier, effect of transmission losses, co-ordination equations, iterative procedure to solve co-ordination equations.

7. Hydro-thermal co-ordination:
   Advantages, combined working of run off river plant and steam plant, reservoir hydro plants and thermal plants-long term operational aspects, scheduling methods.
8. Pollution and environmental problems:
   Energy and environment, Air pollution, Aquatic impacts, nuclear plant and hydro plant impacts.

9. Cogeneration:
   Definition and scope, Topping and Bottoming Cycles, Benefits, cogeneration technologies.

Recommended Books:

2. Power Plant Engineering Dom Kundwar.
EE 811 (a)
Energy Management and Auditing

L T P
3 1 0

External: 100
Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

Energy Scenario and Basics of Energy


Energy Management and Audit


Energy Action Planning and Financial Management


Energy Monitoring and Targeting

Definition, Elements of Monitoring & Targeting System, A Rationale for Monitoring, Targeting and Reporting, Data and Information Analysis, Relating Energy Consumption and Production, CUSUM, Case Study.
Part-B

Electrical System and Motors


Lighting System

Introduction, Basic Terms in Lighting System and Features, Lamp Types and their Features, Recommended Illuminance Levels for Various Tasks/Activities/Locations,


Energy Efficient Technologies in Electrical Systems


Books:

3. Related journal and conference papers.
4. Website: www.energymanagerstraining.com
EE 861 (a)

Energy Management and Auditing Lab

External: 25
Sessional: 50

Note: Atleast four experiments and a case study are to be performed.

**List of experiments:**

1. To obtain polar curve of a lamp.
2. To measure harmonics and do the analysis for any 3-phase system.
3. To measure the currents, voltages and active and reactive powers in a three phase system using energy auditor.
4. To design a lighting system for any auditorium/building/hall.
5. To test a 3-phase machine of unknown rating.

**Case Study:**

1. To perform case study for energy audit of educational institute/industrial unit/administrative or commercial building and prepare a complete report suggesting the changes to be made.
EE 811(b)

Electrical Machine Design

L T P
3 1 0

External: 100

Sessional: 50

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

1. **Principles of design of Machines:** Specific magnetic and electric loadings output, Real and apparent flux densities, temperature rise calculation, Separation of main dimension for DC machines, Induction machines and synchronous machines.

2. **Heating cooling and ventilation:** Cooling of machines, types of ventilation, continuous and intermittent rating.

3. **Design of Transformers:** General considerations, output equation, emf per turn, choice of flux density and current density, main dimensions, leakage reactance and conductor size, design of tank and cooling tubes, calculation of losses, efficiency and regulation, forces winding during short circuit.

Part-B

4. **Three Phase Induction Motors:** General considerations, output equation, choice of specific electric and magnetic loadings, efficiency, power factor, number of slots in stator and rotor, elimination of harmonic torques, Design of stator and rotor winding, slot leakage flux, leakage reactance, equivalent resistance of squirrel cage rotor, magnetizing current, efficiency from design data.

5. **Alternators:** Types of alternators, comparison, specific loadings, output co-efficient, design of main dimensions.

6. **Introduction to Computer Aided Electrical Machine Design.**

Books Suggested:
2. Say M.G. The Performance and Design of A.C. Machines, PITMAN (ELBS).
EE 811(b)

Electrical Machine Design Lab

List of Practical: Perform at least five practicals.

Design of Machines

1) Transformer Design.
2) Induction Motor Design.
3) Synchronous Machine Design.
4) DC machine Design.

Design of windings

5) DC machine Lap windings design.
6) DC machine Wave windings design.
7) AC machine winding design.
EC-811

Neural Networks and Fuzzy Logic

External: 100
Sessional: 50

Course Duration: 45 lectures of one hour each.

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

Fundamentals of Neural Networks
Classical AI and Neural Networks, characteristics of neural networks, Historical perspective.

Supervised Learning
Learning and memory, Representation of perceptron, Linear separability, Perceptron Learning, Training of single layer and multi-layer, back propagation training algorithm, Applications of backpropagation, Universal function approximation. (6)

Attractors Neural Networks
Introduction, Associative memory, Hopfield networks, Content addressable memory, Bidirectional associative memories. (5)

Part-B

ART Networks
Vector quantization & simplified ART architecture, Architectures & algorithms of ART1 & ART2 networks, Applications. (4)

Self-organizing Feature Map
Introduction, Competitive learning, Mexican Hat networks, SOFM algorithm, Applications. (5)
Fuzzy Logic

Basic concepts of Fuzzy Logic, Fuzzy vs Crisp set, Fuzzy uncertainty & Linguistic variables, membership functions, operations on fuzzy sets, fuzzy rules for approximate reasoning, variable inference techniques, defuzzification techniques, Applications of fuzzy logic, Fuzzy system design.

(5)

Books Recommended:

1. Neural Networks – A Classroom Approach by Satish Kumar, TMH.
2. Neural Networks, fuzzy Logic, and Genetic Algorithms by Rajasekaran & Vijayalakshmi Pai, PHI.
5. Fuzzy Logic with engineering applications by Ross, Mc-Graw Hill.

EC-861

Neural Networks and Fuzzy Logic Lab

L T P

0 0 3

External: 25

Sessional: 50

Practicals related to Theory.
EC- 812
Embedded Systems

L T P
3 1 0

External: 100
Sessional: 50

Course Duration: 45 lectures of one hour each.

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

PART-A
Introduction Review of Embedded Hardware
Conventions used on Schematic, Microprocessor Architecture – Interrupt Basic – Shared Data Problems – Interrupt Latency. (10)

PIC Micro controller & Interfacing

PART-B

Introduction to Real Time Operating Systems: Task And Task States, Tasks and Data, Semaphores and shared data (5)

Operating System Services: Message queues, Mailboxes and Pipes, Timer Function, Events, Memory Management, Interrupt Routines in an RTOS Environment, Basic Design Using RTOS. (7)

Book Recommended:
EC-862
Embedded Systems Lab

L T P
0 0 3

External: 25
Sessional: 50

Practicals related to Theory.