ANNA UNIVERSITY TIRUCHIRAPPALLI
Tiruchirappalli – 620 024
Regulations 2007

Syllabus

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

SEMESTER III

MA1201 – MATHEMATICS III

L	T	P
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UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – solution of standard types of first order partial differential equations – Lagrange's linear equation – linear partial differential equations of second and higher order with constant coefficients.

UNIT II FOURIER SERIES 9

Dirichlet's conditions – general Fourier series – odd and even functions – half range sine series – half range cosine series – complex form of Fourier Series – Parseval's identity – harmonic analysis.

UNIT III BOUNDARY VALUE PROBLEMS 9

Classification of second order Quasi linear partial differential equations – solutions of one dimensional wave equation – one dimensional heat equation – steady state solution of two-dimensional heat equation (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

UNIT IV FOURIER TRANSFORM 9

Fourier integral theorem (without proof) – Fourier transform pair – sine and cosine transforms – properties – transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT V Z-TRANSFORM AND DIFFERENCE EQUATIONS 9

Z-transform – elementary properties – inverse Z-transform – Convolution theorem – formation of difference equations – solution of difference equations using Z-transform.

L: 45 T: 15 Total: 60

TEXT BOOK

1. B.S. Grewal, “Higher Engineering Mathematics”, Fortieth Edition, Khanna Publishers, 2007.

REFERENCES

1. R.V. Churchill and J.W. Brown, “Fourier Series and Boundary Value Problems”, Fourth Edition, McGraw-Hill, 1987.
2. T. Veerarajan, “Engineering Mathematics III”, Third Edition, Tata McGraw-Hill Education, 2007.
3. P. Kandasamy, K. Thilagavathy and K. Gunavathy, “Engineering Mathematics”, Vol. III, S. Chand & Company Ltd., 1996.

HS1201 – ENVIRONMENTAL SCIENCE AND ENGINEERING

L	T	P
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UNIT I IMPORTANCE OF ENVIRONMENTAL STUDIES 9

Definition – scope and importance – need for public awareness – forest resources – water resources – mineral resources – land resources – energy resources – food resources – equitable use of resources for sustainable lifestyles.

UNIT II ECOSYSTEMS AND BIO DIVERSITY 9

Concept of ecosystem – structure and function of an ecosystem – energy flow in the ecosystem – food chains – food webs – ecological Pyramids – definition of bio-diversity – bio-geographical classification in India – value of bio-diversity – bio-diversity at global – national and local levels – India as a mega diversity nation – hot spots of bio-diversity – threats to bio-diversity – conservation of bio-diversity

UNIT III ENVIRONMENTAL POLLUTION 9

Definition – causes and effects of environmental pollution – air pollution – water pollution – soil pollution – marine pollution – noise pollution – thermal pollution – nuclear hazards – solid waste management – societal role in pollution prevention – environmental disasters and management.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 9

Unsustainable to sustainable development – concept of conservation – water and energy conservation – rain water harvesting – climate change – global warning – acid rain – ozone layer depletion – nuclear accidents and holocaust – environmental protection act – issues involved in enforcement of environmental legislation – public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 9

Population growth – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of IT in environment and human health

Total: 45

TEXT BOOKS

1. Gilbert M. Masters, “Introduction to Environmental Engineering and Science”, Second Edition, Pearson Education, 2004.
2. T.G. Miller Jr., “Environmental Science Working With the Earth”, Thomson Learning, India Edition, 2007.

REFERENCES

1. Bharucha Erach, “The Biodiversity of India”, Mapin Publishing Pvt., Ltd., 2003.
2. Cunningham, W.P. Copper and T.H. Gorhani, “Environmental Encyclopaedia”, Jaico Publication House, 2001.

ME1209 – THERMAL ENGINEERING

L	T	P
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UNIT I THERMODYNAMICS 9

Basic Concepts – thermodynamic systems – properties – processes – cycle – equilibrium – first law of thermodynamics – application of first law to non-flow and flow process – second law of thermodynamics – Kelvin Plank's statement – Clausius statement – reversibility – Carnot theorem – heat engine – reversed heat engine – entropy.

UNIT II STEAM GENERATION 9

Steam generation – steam properties – dryness fraction – use of steam tables and Mollier chart – simple steam power cycle – Rankine cycle – high pressure boilers – condensers – cooling towers – steam turbine – impulse and reaction – compounding (Qualitative treatment only).

UNIT III AIR COMPRESSORS 9

Air compressors – classification – work done in single stage compressors – volumetric efficiency – effect of clearance – multistage compressor – fundamentals of rotary compressors.

UNIT IV I.C. ENGINES 9

I.C. Engine – air standard cycles – air standard efficiency – Otto, Diesel and Brayton – testing of I.C. Engines – performance curves – FHP determination – heat balance – refrigeration – basic cycle of operation – vapour compression – air conditioning system.

UNIT V HEAT TRANSFER 9

Heat transfer – modes of heat transfer – steady state heat conduction – heat conduction with internal heat generation – extended surfaces – fins – convection – empirical relations – radiation – laws of radiation – radiant heat transfer between two surfaces.

L: 45 T: 15 Total: 60

TEXT BOOKS

1. P.K. Nag, “Basic and Applied Engineering Thermodynamics”, Tata McGraw-Hill, 2002.
2. Rogers and Mayhew, “Engineering Thermodynamics, Work and Heat Transfer”, Addision Wesley, 1999.

REFERENCES

1. B.K. Sachdeva, “Fundamentals of Engineering Heat and Mass Transfer (SI Units)”, New Age International Publishers, 2003.
2. S. Domkundwar and S.C. Arora, “A course in Heat and Mass transfer”, Fourth Edition, Dhanpat Rai & Sons, 1994.

EC1201 – ELECTRONIC DEVICES

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UNIT I ELECTRON BALLISTICS AND APPLICATIONS 9

Force on charged particles in an electric field – magnetic field – calculation of electrostatic and magnetic deflection sensitivity in cathode ray tube – analysis of parallel and perpendicular electric and magnetic fields – cyclotron – energy band structure of conductors – intrinsic and extrinsic semiconductor – N and P type – insulators – Hall effect.

UNIT II SEMICONDUCTOR DIODES 9

PN junction – derivation of diode equation – current components – switching characteristics of diode – common diode applications – characteristics and applications of Varactor diode and Zener diode – Mechanism of Avalanche and Zener breakdown – backward diode – tunnel diode – PIN diode – point contact diode – Schottky barrier diode – photo diode – APD – light emitting diodes.

UNIT III BIPOLAR JUNCTION TRANSISTORS AND FIELD EFFECT TRANSISTORS 9

Bipolar junction transistor – PNP and NPN action – current components – Eber-Moll model – transistor switching times – comparison of CE, CB and CC configuration – BJT applications – construction and characteristics of JFET – Relation between Pinch-off voltage and Drain current – MOSFET – enhancement and depletion types – MESFET – introduction to VMOS and CMOS devices.

UNIT IV TRANSISTOR BIASING 9

BJT – operating point – need for biasing – various biasing methods of BJT – bias stability – stability parameters – biasing methods of FET – use of JFET as a voltage variable resistor (VVR).

UNIT V REGULATED POWER SUPPLY AND POWER CONTROL DEVICES 9

Basic elements of regulated power supply – stabilization – series and shunt voltage regulators – general purpose and monolithic linear regulators – SMPS – power control devices – characteristics and equivalent circuit of UJT – intrinsic stand off ratio – PUT – PNPN diode – two transistor model – SUS, SCR, DIAC,TRIAC.

L: 45 T: 15 Total: 60

TEXT BOOKS

1. Jacob Millman & Christos C. Halkias, “Electronic Devices and Circuits” Tata McGraw-Hill, 1991.
2. Robert T.Paynter, “Introductory Electronic Devices and Circuits”, Seventh Edition**,** Pearson Education, 2006.

REFERENCES

1. R.L. Boylestad and L. Nashelsky, “Electronic Devices and Circuit Theory”, Prentice Hall of India,1997
2. Allen Mottershead, “Electronic Devices and Circuits – An Introduction”, Prentice Hall of India, 2003.
3. S.Salivahanan, N.Sureshkumar and A.Vallavaraj, “Electronic Devices and Circuits”, Tata McGraw-Hill, 1998.

EE1201 – ELECTRIC CIRCUITS

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UNIT I BASIC CIRCUIT CONCEPTS 9

Lumped circuits – circuits elements – V-I relationships of R, L and C – independent sources – dependent sources – simple resistive circuits – Kirchhoff's Laws – analysis of series and parallel circuits – network reduction – voltage division – current division – source transformation – star delta transformation.

UNIT II SINUSOIDAL STEADY STATE ANALYSIS 9

Concepts of phasor and complex impedance and admittance – analysis of simple series and parallel circuits – active power – reactive power and power factor – series resonance and parallel resonance – bandwidth and Q factor – solution of three phase balanced circuits – power measurements by two-wattmeter methods – solution of three phase unbalanced circuits.

UNIT III CIRCUITS AND THEOREMS 9

Analysis of complex circuits using mesh and nodal methods – superposition theorem – Thevenin's theorem – Norton's theorem – reciprocity theorem – compensation theorem – substitution theorem – maximum power transfer theorem – Millman's theorem with applications.

UNIT IV RESPONSE OF ELECTRIC CIRCUITS 9

Concept of complex frequency – pole-zero plots – frequency response of RL, RC and RLC circuits – transient response of RL, RC and RLC series and parallel circuits – free response – step and sinusoidal responses – natural frequency – damped frequency – damping factor and logarithmic decrement – response of circuits for non-sinusoidal periodic inputs.

UNIT V TWO PORT NETWORK AND FILTERS 9

Driving point and transfer impedances – admittances – voltage and current ratios of two port networks – admittance – impedance – hybrid – transmission and image parameters for two port networks – impedance matching – equivalent Π and T networks – passive filters as a two port network – characteristics of ideal filter – low pass and high pass filters.

Total: 45

TEXT BOOKS

1. W.H. Hyatt Jr. and J.E. Kemmerly, "Engineering Circuits Analysis", McGraw-Hill International Editions, 1993.
2. M. Nahvi and J.A. Edminister, "Electric Circuits", Fourth Edition, Schaum's outline series McGraw-Hill, 2007.

REFERENCES

1. A. Sudhakar and S.P. Shyam Mohan, "Circuits and Network Analysis and Synthesis", Tata McGraw-Hill, 2007.
2. M. Arumugam and N. Premkumar, "Electric circuit Theory", Khanna Publishers, 1991.
3. A. Chakrabarti, "Circuit Theory – Analysis and Synthesis", Dhanpat Rai & Co., 2001.
4. Nilsson and Riedel, "Electric Circuits", Eighth Edition, Pearson Education, 2008.

EE1202 – ELECTRICAL MACHINES I

L	T	P
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UNIT I BASIC CONCEPTS OF ROTATING MACHINES 9

Principles of electromechanical energy conversion – single and multiple excited systems – m.m.f of distributed A.C. windings – rotating magnetic field – generated voltage – torque in round rotor machine.

UNIT II DC GENERATORS 9

Constructional details – emf equation – methods of excitation – self and separately excited generators – characteristics of series, shunt and compound generators – armature reaction and commutation – parallel operation of DC shunt and compound generators.

UNIT III DC MOTORS 9

Principle of operation – back emf and torque equation – characteristics of series, shunt and compound motors – starting of DC motors – types of starters – speed control of DC series and shunt motors – testing of DC machines – brake test – Swinburne's test – retardation test and Hopkinson's test.

UNIT IV TRANSFORMERS 9

Constructional details of core and shell type transformers – types of windings – principle of operation – emf equation – transformation ratio – transformer on no-load – parameters referred to HV-LV windings – equivalent circuit – transformer on load – regulation – three phase transformers – vector group.

UNIT V TESTING OF TRANSFORMERS 9

Losses and efficiency – condition for maximum efficiency – testing of transformers – polarity test – Sumpner's test – load test – open circuit and short circuit tests – all day efficiency – parallel operation of single phase transformers – auto transformer.

L: 45 T: 15 Total: 60

TEXT BOOKS

1. D.P. Kothari and I.J. Nagrath, “Electric Machines”, Tata McGraw-Hill, 2004.
2. P.S. Bimbhra, “Electrical Machinery”, Khanna Publishers, 2003.

REFERENCES

1. A.E. Fitzgerald, Charles Kingsley and Stephen D. Umans, “Electric Machinery”, Tata McGraw-Hill, 2003.
2. J.B. Gupta, “Theory and Performance of Electrical Machines”, S.K. Kataria and Sons, 2002.
3. Bhag S. Guru and Huseyin R. Hiziroglu, “Electric Machinery and Transformers”, Third Edition, Oxford University Press, 2001.
4. M.G. Say, “Alternating Current Machines”, Fourth Edition, Pitman and Sons, 1980.

EC1203 – ELECTRONIC DEVICES LABORATORY

L	T	P
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1. Measurement of characteristics of PN Junction Diode.
2. Measurement of characteristics of Zener Diode
3. Measurement of characteristics of Special Diodes such as
   - (i) Varactor Diode
   - (ii) Tunnel Diode
   - (iii) Photo Diode
   - (iv) Schottky Diode
4. Clipper and Clamper Circuits using Diode.
5. Design and testing of Rectifiers with and without Filters.
6. Input and Output characteristics of BJT and determination of h-parameters from the graph.
7. Output characteristics of JFET.
   - (i) Plot of Transfer characteristics from the output characteristics.
   - (ii) Determination of pinch off voltage and I_{dss}
8. Fixed Bias amplifier circuits using BJT.
   - (i) Waveforms at input and output without bias.
   - (ii) Determination of bias resistance to locate Q-point at center of load line.
   - (iii) Measurement of h_{FE} and gain.
   - (iv) Calculation of $h_{ie}=V_T/I_{bdc}$ and gain assuming $h_{FE}= h_{fe}$.
   - (v) Plot of frequency response.
9. BJT Amplifier using voltage divider bias (self bias) with unbypassed emitter resistor.
   - (i) Measurement of input resistance and gain
   - (ii) Comparison with calculated values.
   - (iii) Plot of DC collector current as a function of collector resistance.
10. Source follower with Bootstrapped gate resistance.
    - (i) Measurement of gain, input resistance and output resistance with and without
    - (ii) Bootstrapping.
    - (iii) Comparison with calculated values.
11. Measurement of UJT and SCR Characteristics.
    - (i) Firing Characteristics of SCR.
    - (ii) Measurements of Intrinsic stand off ratio of UJT.
    - (iii) Measurement of DIAC and TRIAC Characteristics.
12. Study of SMPS.

Total: 45

EE1203 – ELECTRIC CIRCUITS LABORATORY

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1. Verification of Kirchhoff's voltage and current laws – Thevenin's and Norton's Theorems
2. Study of oscilloscope and measurement of sinusoidal voltage, frequency and power factor
3. Measurement of time constant of series R-C circuits
4. Frequency response of RC and RL circuits
5. Resonant frequency and frequency response of a series RLC circuit
6. Study of the effect of Q on frequency response and bandwidth of series and parallel resonant circuits
7. Study of low pass and high pass filters
8. Measurement of real power, reactive power, power factor and impedance of RC, RL and RLC circuits using voltmeters and ammeters
9. Power measurement in a three phase circuit by two wattmeters
10. Study of first and second order circuit transients by digital simulation

Total: 45

EE1204 – ELECTRICAL MACHINES LABORATORY I

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1. Open circuit and load characteristics of D.C. separately and self excited shunt generator
2. Load characteristics of D.C. compound generator with differential and cumulative connection
3. Load characteristics of D.C. shunt and compound motor
4. Load characteristics of D.C .series motor
5. Swinburne's test and speed control of D.C. shunt motor
6. Hopkinson's test on D.C. motor – generator set
7. Load test on single- phase transformer and three phase transformer connections
8. Open circuit and short circuit tests on single phase transformer
9. Sumpner's test on transformers
10. Separation of no-load losses in single phase transformer

Total: 45

SEMESTER IV

EC1207 – PRINCIPLES OF COMMUNICATION ENGINEERING

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UNIT I AMPLITUDE MODULATION 9

Principles of amplitude modulation – AM envelope – frequency spectrum and bandwidth – modulation index and percent modulation – AM power distribution – AM modulator circuits – low level AM modulator – medium power AM modulator – AM transmitters – low level transmitters – high level transmitters – receiver parameters – AM receivers – TRF – super heterodyne receivers – double conversion AM receivers.

UNIT II ANGLE MODULATION 9

Angle modulation – FM and PM waveforms – phase deviation and modulation index – frequency deviation – phase and frequency modulators and demodulators – frequency spectrum of angle modulated waves – bandwidth requirement – broadcast band FM – average power FM and PM modulators – direct FM and PM – direct FM transmitters – indirect transmitters – angle modulation Vs. amplitude modulation – FM receivers FM demodulators – PLL FM demodulators – FM noise suppression – frequency Vs. phase modulation.

UNIT III DIGITAL MODULATION 9

Introduction – binary PSK – DPSK – differentially encoded PSK – QPSK – M-ary PSK – binary FSK – MSK – GMSK – duobinary encoding – performance comparison of various systems of digital modulation.

UNIT IV BASEBAND DATA TRANSMISSION 9

Sampling theorem – quadrature sampling of bandpass signals – reconstruction of message from its samples – signal distortion in sampling – discrete PAM signals – power spectra of discrete PAM signals – ISI Nyquist criterion for distortion less baseband binary transmission – eye pattern – baseband M-ary PAM systems – adaptive equalization for data transmission.

UNIT V SPREAD SPECTRUM AND MULTIPLE ACCESS TECHNIQUES 9

Introduction – pseudo – noise sequence – DS spread spectrum with coherent binary PSK – processing gain – FH spread spectrum – multiple access techniques – wireless communications – TDMA and CDMA – wireless communication systems – source coding of speech for wireless communications.

Total: 45

TEXT BOOKS

1. Wayne Tomasi, "Electronic Communication Systems Fundamentals Through Advanced", Pearson Education, 2001.
2. Simon Haykin, "Digital Communications", John Wiley & Sons, 2003.

REFERENCES

1. Simon Haykin, "Communication Systems", Fourth Edition, John Wiley & Sons, 2001.
2. Taub and Schilling, "Principles of Communication Systems", Second Edition, Tata McGraw-Hill, 2003.
3. Martin S.Roden, "Analog and Digital Communication System", Third Edition, Prentice Hall of India, 2002.
4. Blake, "Electronic Communication Systems", Second Edition, Thomson Delman, 2002.

EC1251 – ELECTRONIC CIRCUITS

L	T	P
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UNIT I MIDBAND ANALYSIS OF SMALL SIGNAL AMPLIFIERS 9

Midband analysis of single stage CE, CB and CC amplifiers – Miller's theorem – comparison of CB, CE and CC amplifiers – Darlington connection using similar and complementary transistors – bootstrapping – basic emitter coupled differential amplifier circuit – CMRR – use of constant current circuit to improve CMRR – use as linear amplifier – limiter – amplitude modulator – FET amplifiers – CS, CG and CD – multistage amplifiers.

UNIT II FREQUENCY RESPONSE OF AMPLIFIERS 9

General shape of frequency response of amplifiers – cut-off frequencies and bandwidth – low frequency analysis of amplifiers – hybrid – pi equivalent circuit of BJT – high frequency analysis of BJT amplifiers – FET – high frequency analysis – gain-bandwidth product – multistage amplifiers – amplifier rise time and lag time with relation to cut off frequencies.

UNIT III UNTUNEDAMPLIFIERS 9

Amplifiers – classification – distortion – frequency response -analysis of low frequency response of RC-coupled amplifier – cascaded CE stage – step response of an amplifier – bandpass of cascaded stages – effect of an emitter (or a source) by pass capacitor on low – frequency response – noise.

UNITIV FEEDBACK AMPLIFIERS AND OSCILLATORS 9

Feedback concept – characteristics of negative feedback amplifiers – analysis of feedback amplifiers – voltage series – voltage shunt – current series – current shunt types – oscillator – general form – analysis of sinusoidal – phase-shift – resonant – circuit – Wien Bridge – Colpits – Unijunction and Crystal oscillator.

UNIT V LARGE SIGNAL AMPLIFIERS 9

Classification of amplifiers (class A, B, AB, C and D) – efficiency of class A – RC coupled and transformer-coupled power amplifiers – class B complementary-symmetry – push-pull power amplifiers – calculation of power output – efficiency and power dissipation – crossover distortion and methods of elimination – heat sink design.

L: 45 T: 15 Total: 60

TEXT BOOKS

1. J. Millman and C. Halkias, "Integrated Electronics", Tata McGraw-Hill.
2. T. Robert Paynter, "Introductory Electronic Devices and Circuits", Seventh Edition, Pearson Education, 2006.

REFERENCES

1. L. Robert Boylestad and Louis Nashelsky, Eighth Edition, Pearson Education, 2002.
2. Jacob Millman and Christos C. Halkias, "Electronic Devices and Circuits" Tata McGraw-Hill, 1991.
3. S. Salivahanan, N. Sureshkumar and A. Vallava Raj, "Electronic Devices and Circuits", Tata McGraw-Hill, 1998.
4. Floyd, "Electronic Devices", Sixth Edition, Pearson Education, 2003.

EE1251 – MEASUREMENTS AND INSTRUMENTATION

L	T	P
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UNIT I FUNCTIONAL ELEMENTS OF AN INSTRUMENT 9

Functional elements of an instrument – static and dynamic characteristics – errors in measurement – statistical evaluation of measurement data – standards and calibration.

UNIT II ELECTRICAL AND ELECTRONICS INSTRUMENTS 9

Principle and types of analog and digital voltmeters, ammeters, multimeters – single and three phase wattmeters and energy meters – magnetic measurements – determination of B-H curve and measurements of iron loss – instrument transformers – instruments for measurement of frequency and phase.

UNIT III COMPARISON METHODS OF MEASUREMENTS 9

D.C. and A.C. potentiometers, D.C. and A.C. bridges – transformer ratio bridges – self-balancing bridges – interference and screening – multiple earth and earth loops – electrostatic and electromagnetic interference – grounding techniques.

UNIT IV STORAGE AND DISPLAY DEVICES 9

Magnetic disk and tape – recorders – digital plotters – printers – CRT display – digital CRO – LED – LCD – dot matrix display.

UNIT V TRANSDUCERS AND DATA ACQUISITION SYSTEMS 9

Classification of transducers – selection of transducers – resistive – capacitive – inductive transducers – piezoelectric – optical – digital transducers – elements of data acquisition system – A/D – D/A converters.

Total: 45

TEXT BOOKS

1. E.O. Doebelin, “Measurement Systems – Application and Design”, Tata McGraw-Hill, 2003.
2. A. K. Sawhney, “A Course in Electrical and Electronic Measurements and Instrumentation”, Dhanpat Rai & Co., 2004.

REFERENCES

1. A.J. Bouwens, “Digital Instrumentation”, Tata McGraw-Hill, 1997.
2. D.V.S. Moorthy, “Transducers and Instrumentation”, Prentice Hall of India, 2003.
3. H.S. Kalsi, “Electronic Instrumentation”, Tata McGraw-Hill, 1995.
4. Martin Reissland, “Electrical Measurements”, New Age International Publishers, 2001.
5. J. B. Gupta, “A Course in Electronic and Electrical Measurements”, S.K. Kataria & Sons, 2003.
6. E.W. Golding, and F.G. Widdis, “Electrical Measurements and Measuring Instruments”, Wheeler & Co., 1994.

EE1252 – ELECTROMAGNETIC THEORY

L	T	P
3	1	0

UNIT I ELECTROSTATICS 9

Coulomb's Law – electric field intensity – field due to point and continuous charges – Gauss's law and application – electrical potential – electric field and equipotential plots – electric field in free space – conductors – dielectric – dielectric polarization – electric field in multiple dielectrics – boundary conditions – Poisson's and Laplace's equations – capacitance-energy density – dielectric strength.

UNIT II MAGNETOSTATICS 9

Lorentz Law of force – magnetic field intensity – Biot-savart's Law – Ampere's Law – magnetic field due to straight conductors – circular loop – infinite sheet of current – magnetic flux density (B) – B in free space – conductor – magnetic materials – magnetization – magnetic field in multiple media – boundary conditions – scalar and vector potential – magnetic force – torque – inductance – energy density – magnetic circuits.

UNIT III ELECTRODYNAMIC FIELDS 9

Faraday's laws , induced emf – transformer and motional EMF – Maxwell's equations (differential and integral forms) – displacement current – relation between field theory and circuit theory.

UNIT IV ELECTROMAGNETIC WAVES 9

Generation – electro magnetic wave equations – wave parameters – velocity – intrinsic impedance – propagation constant – waves in free space – lossy and lossless dielectrics – conductors-skin depth – pointing vector – plane wave reflection and refraction.

UNIT V FIELD COMPUTATION 9

Problem formulation – boundary Conditions – direct integration method – method of images – finite difference method – finite element method

L: 45 T: 15 Total: 60

TEXT BOOKS

1. William H. Hayt, “Engineering Electromagnetics”, Tata McGraw Hill, 2001.
2. K.A. Gangadhar and P.M. Ramanathan, “Field Theory”, Khanna Publishers, 2008.

REFERENCES

1. Joseph A. Edminister, “Theory and Problems of Electromagnetics”, Second Edition, Schaum Series, Tata McGraw-Hill, 2006.
2. Kraus and Fleish, “Electromagnetics with Applications”, Fifth Edition, McGraw-Hill International Editions, 1999.
3. Sadiku, “Elements of Electromagnetics”, Fourth Edition, Oxford University Press, 2007.
4. John D. Kraus, “Electromagnetics”, Fourth Edition, McGraw-Hill book Co., 1991.

EE1253 – CONTROL SYSTEMS ENGINEERING

L	T	P
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UNIT I SYSTEMS AND THEIR REPRESENTATION 9

Basic elements in control systems – open and closed loop systems – electrical analogy of mechanical and thermal systems – transfer function – synchros – AC and DC servomotors – block diagram reduction techniques – Signal flow graphs.

UNIT II TIME RESPONSE 9

Time response – time domain specifications – types of test input – I and II order system response – error coefficients – generalized error series – steady state error – P, PI, PID modes of feed back control.

UNIT III FREQUENCY RESPONSE 9

Frequency response – Bode plot – Polar plot – constant M and N circles – Nichols chart – determination of closed loop response from open loop response – correlation between frequency domain and time domain specifications.

UNIT IV STABILITY OF CONTROL SYSTEM 9

Characteristics equation – location of roots in S plane for stability – Routh Hurwitz criterion – root locus construction – effect of pole – zero addition – gain margin and phase margin – Nyquist stability criterion.

UNIT V COMPENSATOR DESIGN 9

Performance criteria – lag, lead and lag-lead networks – compensator design using Bode plots.

L: 45 T: 15 Total: 60

TEXT BOOKS

1. K. Ogata, “Modern Control Engineering”, Fourth Edition, Pearson Education/Prentice Hall of India, 2003.
2. I.J. Nagrath and M. Gopal, “Control Systems Engineering”, New Age International Publishers, 2003.

REFERENCES

1. B.C. Kuo, “Automatic Control Systems”, Prentice Hall of India, 1995.
2. M. Gopal, “Control Systems, Principles and Design”, Tata McGraw-Hill, 2002.
3. M.N. Bandyopadhyay, “Control Engineering Theory and Practice”, Prentice Hall of India, 2003.

EE1254 – ELECTRICAL MACHINES II

L	T	P
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UNIT I SYNCHRONOUS GENERATOR 9

Constructional details – types of rotors – E.M.F. equation – synchronous reactance – armature reaction – voltage regulation – E.M.F, M.M.F, Z.P.F. and A.S.A. methods – synchronizing and parallel operation – synchronizing torque – change of excitation and mechanical input – two reaction theory – determination of direct and quadrature axis synchronous reactance using slip test – operating characteristics – capability curves.

UNIT II SYNCHRONOUS MOTOR 9

Principle of operation – torque equation – operation on infinite bus bars – V-curves – power input and power developed equations – starting methods – current loci for constant power input – constant excitation and constant power developed.

UNIT III THREE PHASE INDUCTION MOTOR 9

Constructional details – types of rotors – principle of operation – slip – equivalent circuit – slip-torque characteristics – condition for maximum torque – losses and efficiency – load test, no load and blocked rotor tests – circle diagram – separation of no load losses – double cage rotors – induction generator – synchronous induction motor.

UNIT IV STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR 9

Need for starting – types of starters – stator resistance and reactance – rotor resistance – autotransformer and star-delta starters – speed control – change of voltage, torque, number of poles and slip – cascaded connection – slip power recovery scheme.

UNIT V SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES 9

Constructional details of single phase induction motor – double revolving field theory and operation – equivalent circuit – no load and blocked rotor test – performance analysis – starting methods of single-phase induction motors – special machines – shaded pole induction motor – reluctance motor – repulsion motor – Hysteresis motor – stepper motor and AC series motor.

L: 45 T: 15 Total: 60

TEXT BOOKS

1. D.P. Kothari and I.J. Nagrath, “Electric Machines”, Tata McGraw-Hill, 2004.
2. P.S. Bhimbhra, “Electrical Machinery”, Khanna Publishers, 2003.

REFERENCES

1. A. E. Fitzgerald, Charles Kingsley and Stephen D. Umans, “Electric Machinery”, Tata McGraw-Hill, 2003.
2. J.B. Gupta, “Theory and Performance of Electrical Machines”, S.K. Kataria & Sons, 2002.

EC1262 – ELECTRONIC CIRCUITS LABORATORY

L	T	P
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1. Series and Shunt feedback amplifiers – Frequency response, Input and output impedance calculation
2. Class B Complementary symmetry power amplifier
   - Observation of the output wave form with cross over Distortion.
   - Modification of the circuit to avoid cross over distortion.
   - Measurement of maximum power output.
   - Determination of efficiency.
   - Comparison with calculated values.
3. Differential amplifier using BJT.
   - Construction of the circuit.
   - Measurement of DC collector current of individual transistors.
   - Equalization of DC current using individual emitter resistance (50 – 100 Ohms)
   - Measurement of CMRR.
4. Design of oscillator
   - RC Phase shift
   - Wein Bridge Oscillator
   - Hartley and Colpitts Oscilator.
5. Class C Tuned Amplifier.

Total: 45

EE1255 – CONTROL AND INSTRUMENTATION LABORATORY

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CONTROL LABORATORY

1. Determination of transfer function parameters of a D.C .servo motor
2. Determination of transfer function parameters of A.C. servo motor
3. Analog simulation of type-0 and type-1 system
4. Digital simulation of linear systems
5. Digital simulation of non-linear systems
6. Design and implementation of compensators
7. Design of P, PI and PID controllers
8. Stability analysis of linear systems
9. Closed loop control system
10. Study of synchros

INSTRUMENTATION LABORATORY

1. Study of displacement and pressure transducers
2. A.C. bridges
3. D.C. bridges
4. Instrumentation amplifiers
5. A/D and D/A converters
6. Study of transients
7. Calibration of single-phase and three-phase energy meter
8. Calibration of current transformer

Total: 45

EE1256 – ELECTRICAL MACHINES LABORATORY II

L	T	P
0	0	3

1. Regulation of three phase alternator by E.M.F. and M.M.F. methods
2. Regulation of three phase alternator by Z.P.F. and A.S.A. methods
3. Regulation of three phase salient pole alternator by slip test
4. Measurements of negative sequence and zero sequence impedance of alternators
5. V and inverted V-curves of three phase synchronous motor
6. Load test on three-phase induction motor
7. No load and blocked rotor test on three-phase induction motor
8. Separation of no-load losses of three-phase induction motor
9. Load test on single-phase induction motor
10. No load and blocked rotor test on single-phase induction motor

Total: 45

SEMESTER V

MA1251 – NUMERICAL METHODS

L	T	P
3	1	0

UNIT I SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS 9

Linear interpolation methods (method of false position) – Newton's method –Solution of linear system by Gaussian elimination and Gauss – Jordon methods – iterative methods: Gauss Jacobi and Gauss-Seidel methods – Inverse of a matrix by Gauss–Jordan method – Eigen value of a matrix by power method

UNIT II INTERPOLATION AND APPROXIMATION 9

Lagrangian Polynomials – Divided differences – Interpolating with a cubic spline – Newton's forward and backward difference formulae.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 9

Derivatives from difference tables – Divided differences and finite differences – Numerical integration by Trapezoidal and Simpson's 1/3 and 3/8 rules – Romberg's method – Double integrals using trapezoidal and Simpson's rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9

Single step Methods: Taylor Series method – Euler's method – Modified and Improved Euler's method – Fourth order Runge-Kutta method for solving first and second order equations – Multi-step methods: Milne's and Adam's predictor and corrector methods.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9

Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by implicit and explicit methods – one dimensional wave equation and two dimensional Laplace and Poisson equations.

L: 45 T: 15 Total: 60

TEXT BOOK

1. C.F. Gerald and P.O. Wheatley “Applied Numerical Analysis”, Seventh Edition, Pearson Education, 2007.

REFERENCES

1. M.K. Jain, S.R.K. Iyengar and R.K. Jain, “Numerical Methods for Scientific and Engineering Computation” Fourth Edition, New Age International Publishers, 2003.
2 M.K. Venkatraman, ‘Numerical Methods’, National Publication Company, 1991.
3. P. Kandasamy, K. Thilakavthy and K. Gunavathy, “Numerical Methods”, Second Edition, S.Chand & Co., 2003.

EC1307 – DIGITAL SIGNAL PROCESSING

L	T	P
3	1	0

UNIT I SIGNALS 9

Classification of systems – Continuous – Discrete – Linear – Causal – Stable – Dynamic – Recursive – Time variance – Classification of signals – Continuous and discrete – Energy and power – Mathematical representation of signals – Spectral density – Sampling techniques – Quantization – Quantization error – Nyquist rate – Aliasing effect – Digital signal representation – Analog to digital conversion**.**

UNIT II DISCRETE TIME SYSTEM ANALYSIS 9

z-transform and its properties – Inverse Z-transforms – Difference equation – Solution by Z-transform – Application to discrete systems – Stability analysis – Frequency response – Convolution – Fourier transform of discrete sequence – Discrete Fourier series.

UNIT III DISCRETE FOURIER TRANSFORM & COMPUTATION 9

DFT properties – Magnitude and phase representation – Computation of DFT using FFT algorithm – DIT and DIF – FFT using radix-2 – Butterfly structure.

UNIT IV DESIGN OF DIGITAL FILTERS 9

FIR and IIR filter realization – Parallel and cascade forms – FIR design – Windowing Techniques – Need and choice of windows – Linear phase characteristics – IIR design – Analog filter design – Butterworth and Chebyshev approximations – Digital design using impulse invariant and bilinear transformation – Warping – Prewarping – Frequency transformation.

UNIT V PROGRAMMABLE DSP CHIPS 9

Architecture and features of TMS320C54X signal processing chip – Quantization effects in designing digital filters.

L: 45 T: 15 Total: 60

TEXT BOOKS

1. J.G. Proakis and D.G. Manolakis, “Digital Signal Processing Principles, Algorithms and Applications”, Pearson Education / Prentice Hall of India, New Delhi, 2003
2. S.K. Mitra, “Digital Signal Processing – A Computer Based Approach”, Tata McGraw Hill, New Delhi, 2001.

REFERENCES

1. Alan V. Oppenheim, Ronald W. Schafer and John R. Buck, “Discrete-Time Signal Processing”, Pearson Education, New Delhi, 2003
2. B. Venkataramani, M. Bhaskar, “Digital Signal Processors, Architecture, Programming and Applications”, Tata McGraw Hill, New Delhi, 2003
3. S. Salivahanan, A. Vallavaraj, C. Gnanapriya, “Digital Signal Processing”, Tata McGraw Hill, New Delhi, 2003
4. Texas TMS320C54X user manual (website).

EC1308 – DIGITAL AND LINEAR INTEGRATED CIRCUITS

L	T	P
3	0	0

UNIT I COMBINATIONAL CIRCUITS 9

Switching functions and simplification using K– Maps and Quine McCluskey method – Design of Logic gates – Design of adder, subtractor, comparators, code converters, encoders, decoders, multiplexers and demultiplexers – Function realization using gates – Multiplexers

UNIT II SEQUENTIAL CIRCUITS 9

Synchronous Sequential Circuits – Flip flops: SR, D, JK and T – Analysis of synchronous sequential circuits – Design of synchronous sequential circuits – Counters state diagram

UNIT III STATE DIAGRAM AND ANALYSIS 9

State reduction – State assignment – Asynchronous sequential circuit – Analysis of asynchronous sequential machines – State assignment – Asynchronous design problem

UNIT IV CHARACTERISTICS OF OP-AMP 9

Ideal Op-amp characteristics – DC characteristics – AC characteristics – Offset voltage and current – Voltage series feedback and shunt feedback amplifiers – Differential amplifier – Frequency response of Op-amp – Basic applications of Op-amp – Summer – Differentiator and Integrator

UNIT V APPLICATIONS OF OPAMP and SPECIAL ICS 9

Instrumentation amplifier – First and second order active filters, V/I – I/V converters – Comparators – Multivibrators – Waveform generators – Clippers – Clampers – Peak detector – S/H circuit – D/A converter – A/D converter – Special IC's – 555 Timer circuit – Phase locked loop circuit

Total: 45

TEXT BOOKS

1. M. Morris Mano, 'Digital Logic and Computer Design', Prentice Hall of India, 2002
2. Ramakant A. Gayakward, 'OP-AMPs and Linear Integrated Circuits', 4th Edition, Pearson Education / Prentice Hall of India, 2003
3. D.Roy Choudhary, Sheil B.Jani, 'Linear Integrated Circuits', 2nd Edition, New Age Publishers, 2003

REFERENCES

1. Charles H.Roth, "Fundamentals Logic Design", Cengage Learning, 5th Edition, 2004
2. Floyd, "Digital Fundamentals", 8th Edition, Pearson Education, 2003
3. John F.Wakerly, "Digital Design Principles and Practice", 3rd Edition, Pearson Education, 2002
4. Jacob Millman, Christos C.Halkias, "Integrated Electronics – Analog and Digital circuits System", Tata McGraw Hill, 2003
5. Balbanian, "Digital Logic Design Principles", Wiley student Edition.
6. David A. Bell, "Op-amp & Linear ICs", Prentice Hall of India, 2nd Edition, 1997

CS1201 – DATA STRUCTURES

L	T	P
3	0	0

UNIT I PROBLEM SOLVING **9**

Problem solving – top-down design – implementation – verification – efficiency – analysis – sample algorithms.

UNITII LISTS – STACKS AND QUEUES **8**

Abstract data type (ADT) – the list ADT – the stack ADT – the queue ADT

UNITIII TREES **10**

Binary trees – the search tree ADT – binary search trees – AVL trees – tree traversals – hashing – general idea – hash function – separate chaining – open addressing – linear probing – priority queues (Heaps) – model – simple implementations – binary heap

UNITIV SORTING **9**

Insertion sort – shell sort – heap sort – merge sort – quick sort – external sorting

UNITV GRAPHS **9**

Topological sort – shortest path algorithms – unweighted shortest paths – Dijkstra's algorithm – minimum spanning tree – Prim's algorithm – applications of Depth-First Search – undirected graphs – biconnectivity – introduction to NP completeness

Total: 45

TEXT BOOKS

1. R. G. Dromey, "How to Solve it by Computer", Prentice-Hall of India, 2002.
2. M. A. Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, 2002.

REFERENCES

1. Y. Langsam M. J. Augenstein and A. M. Tenenbaum, "Data Structures using C", Pearson Education, 2004
2. Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures – A Pseudocode Approach with C", Thomson Brooks / COLE, 1998.
3. Aho J.E. Hopcroft and J. D. Ullman, "Data Structures and Algorithms", Pearson Education, 1983.
4. Harowitz, Sahani, Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, University Press, 2007.

EE1301 – ELECTRICAL MACHINE DESIGN

L	T	P
3	1	0

UNIT I MAGNETIC CIRCUITS AND COOLING OF ELECTICAL MACHINES 9

Concept of magnetic circuit – MMF calculation for various types of electrical machines – Real and apparent flux density of rotating machines – Leakage reactance calculation for transformers, Induction and synchronous machine – Thermal ratings Continuous, Short time and Intermittent – Direct and Indirect cooling methods – Cooling of turbo alternators

UNIT II D.C. MACHINES 9

Constructional details – Winding design – Output equation – Main dimensions – Choice of specific loadings – Choice of number of poles – Armature design – Design of field poles and field coil – Design of commutator and brushes – Losses and efficiency calculations

UNIT III TRANSFORMERS 9

Constructional details of core and shell type transformers – Amorphous Cores – Output rating of single phase and three phase transformers – Optimum design of transformers – Design of core, Yoke and windings for core and shell type transformers – Equivalent circuit parameter from design data – Losses and efficiency calculations – Design of tank and cooling tubes

UNIT IV THREE PHASE INDUCTION MOTORS 9

Constructional details of squirrel cage and slip ring motors – Output equation – Main dimensions – Choice of specific loadings – Design of stator – Design of squirrel cage and slip ring rotor – Equivalent circuit parameters from design data – Losses and efficiency calculations

UNIT V SYNCHRONOUS MACHINES 9

Constructional details of cylindrical pole and salient pole alternators – Winding design – Output equation – Choice of specific loadings – Main dimensions – Short circuit ratio – Design of stator and rotor of cylindrical pole and salient pole machines – Design of field coil – Performance calculation from design data – Introduction to computer aided design

L: 45 T: 15 Total: 60

TEXT BOOKS

1. A.K. Sawhney, "A Course in Electrical Machine Design", Dhanpat Rai and Sons, New Delhi, 6th Edition, 2006
2. S.K. Sen, "Principles of Electrical Machine Design with Computer Programmes", Oxford and IBH Publishing Co. Pvt Ltd., New Delhi, 1987

REFERENCES

1. R.K. Agarwal, "Principles of Electrical Machine Design", S.K.Kataria & Sons, Delhi, 2002
2. V.N. Mittle and A. Mittle, "Design of Electrical Machines", Standard Publications & Distributors, Delhi, 2002

EE1302 – TRANSMISSION AND DISTRIBUTION ENGINEERING

L	T	P
3	1	0

UNIT I TRANSMISSION SYSTEMS 9

Structure of electric power system – Various levels Generation, Transmission and distribution – HVDC and EHV AC transmission – Comparison of economics of transmission – Technical performance and reliability – Application of HVDC transmission system – FACTS (qualitative treatment only) – TCSC – SVC – STATCOM – UPFC

UNIT II TRANSMISSION LINE PARAMETERS 9

Parameters of single and three phase transmission lines with single and double circuits – Resistance, Inductance and Capacitance of solid, stranded and bundled conductors – Symmetrical and unsymmetrical spacing – Transposition – Application of self and mutual GMD – Skin and proximity effects – Interference with neighboring communication circuits – Typical configuration – Conductor types and electrical parameters of 400, 220, 110, 66 and 33 kV lines

UNITIII MODELLING AND PERFORMANCE OF TRANSMISSION LINES 9

Classification of lines – Short, medium and long line – Equivalent circuits, attenuation constant – Phase constant – Surge impedance – Transmission efficiency and voltage regulation – Real and reactive power flow in lines – Power-angle diagram – Surge-impedance loading – Load ability limits based on thermal loading – Angle and voltage stability considerations – Shunt and series compensation – Ferranti effect and corona loss

UNIT IV INSULATORS AND CABLES 9

Insulators – Types – Voltage distribution in insulator string and grading – Improvement of string efficiency – Underground cables – Constructional features of LT and HT cables – Capacitance – Dielectric stress and grading – Thermal characteristics

UNIT V SUBSTATION GROUNDING SYSTEM AND DISTRIBUTION SYSTEM 9

Types of substations – Bus-bar arrangements – Substation bus schemes – Single bus scheme – Double bus with double breaker – Double bus with single breaker – Main and transfer bus – Ring bus – Breaker-and-a-half with two main buses – Double bus-bar with bypass isolators – Resistance of grounding systems – Resistance of driven rods, resistance of grounding point electrode – Grounding grids – Design principles of substation grounding system – Neutral grounding

L: 45 T: 15 Total: 60

TEXT BOOKS

1. Gupta B.R., “Power System Analysis and Design”, S.Chand, New Delhi, 2003
2. Singh S.N., “Electric Power Generation, Transmission and Distribution”, Prentice Hall of India, New Delhi, 2002

REFERENCES

1. Luces M. Fualkenberry, Walter Coffer, “Electrical Power Distribution and Transmission”, Pearson Education, 1996
2. Hadi Saadat, “Power System Analysis”, Tata McGraw Hill Publishing Company, 2003
3. Wadhwa C.L, “Electric Power Systems”, New Age International (P) Ltd., 2000
4. Turan Gonen “Electric Power Distribution Engineering”, CRC Press, 2nd Edition, 2007

EC1309 – DIGITAL SIGNAL PROCESSING LABORATORY

L	T	P
0	0	3

1. Study of various Addressing Modes of DSP using Simple Programming Examples
2. Sampling of Input Signal and Display
3. Implementation of FIR Filter
4. Calculation of FFT
5. Generation of Signals using MATLAB
6. Linear and Circular Convolution of Two Sequences using MATLAB
7. Sampling and Effect of Aliasing using MATLAB
8. Design of FIR Filters using MATLAB
9. Design of IIR Filters using MATLAB
10. Calculation of FFT of a Signal using MATLAB
11. FIR Filter Implementation using TMS320XX Processor
12. IIR Filter Implementation using TMS320XX Processor

Total: 45

EC1310 – DIGITAL AND LINEAR INTEGRATED CIRCUITS LABORATORY

L	T	P
0	0	3

1. Design and implementation of Adders and Subtractors using logic gates
2. Design and implementation of code converters using logic gates
3. BCD to excess-3 code conversion and vice-versa
4. Binary to gray code conversion and vice-versa
5. Design and implementation of Multiplexer and De-multiplexer using logic gates and study of IC74150 and IC74154
6. Design and implementation of encoder and decoder using logic gates and study of IC74145 and IC74147
7. Implementation of SISO, SIPO, PISO and PIPO shift registers using Flip-flops
8. Differential amplifiers
9. Integrator and Differentiator
10. Instrumentation amplifier
11. Active low-pass and band-pass filter
12. Astable and Monostable multivibrators

P: 45 Total: 45

CS1204 – DATA STRUCTURES LABORATORY

L	T	P
0	0	3

Implement the following exercises using C

1. Array Implementation of List ADT
2. Linked List Implementation of List ADT
3. Cursor Implementation of List ADT
4. Array Implementation of Stack ADT
5. Linked List Implementation of Stack ADT
6. The following three exercises are to be done by implementing the following source files
   (a) Program for 'Balanced Paranthesis'
   (b) Array Implementation of Stack ADT
   (c) Linked List Implementation of Stack ADT
   (d) Program for 'Evaluating Postfix Expressions'

   An appropriate header file for the Stack ADT should be included in (a) and (d)

   I. Implement the application for checking 'Balanced Paranthesis' using Array Implementation of Stack ADT (by implementing files (a) and (b) given above)

   II. Implement the application for checking 'Balanced Paranthesis' using Linked List Implementation of Stack ADT (by using file (a) from experiment 1 and implementing file (c))

   III. Implement the application for 'Evaluating Postfix Expressions' using array and Linked List implementations of Stack ADT (by Implementing file (d) and using file (b) – and then by using files (d) and (c))
7. Queue ADT
8. Search Tree ADT – Binary Search Tree
9. Heap Sort
10. Quick Sort

P: 45 Total: 45

SEMESTER VI

MG1352 – TOTAL QUALITY MANAGEMENT

(Common to EEE, EIE, ICE)

L	T	P
3	0	0

UNIT I QUALITY **9**

Definition of quality – Dimensions of quality – Quality planning – Quality costs – Analysis techniques for quality costs – Basic concepts of total quality management – Historical review – Principles of TQM – Leadership – Concepts – Role of senior management – Quality council – Quality statements – Strategic planning – Deming philosophy – Barriers to TQM implementation.

UNIT II TQM PRINCIPLES **9**

Customer satisfaction – Customer perception of quality – Customer complaints – Service quality – Customer retention – Employee involvement – Motivation – Empowerment – Teams – Recognition and reward – Performance appraisal – Benefits – Continuous process improvement – Juran trilogy – PDSA cycle – 5S-Kaizen – Supplier partnership – Partnering – Sourcing – Supplier selection – Supplier rating – Relationship development – Performance measures – Basic concepts – Strategy – Performance measure.

UNIT III STATISTICAL PROCESS CONTROL (SPC) **9**

The seven tools of quality – Statistical fundamentals – Measures of central tendency and dispersion – Population and sample – Normal curve – Control charts for variables and attributes – Process capability – Concept of six sigma – New seven management tools.

UNIT IV TQM TOOLS **9**

Benchmarking – Reasons to benchmark – Benchmarking process – Quality Function Deployment (QFD) – House of quality – QFD process – Benefits – Taguchi quality loss function – Total Productive Maintenance (TPM) – Concept – Improvement needs – FMEA – Stages of FMEA.

UNIT V QUALITY SYSTEMS **9**

Need for ISO 9000 and other quality systems – ISO 9000:2000 quality systems –Elements, implementation of quality system – Documentation – Quality auditing – TS 16949 – ISO 14000 – Concept – Requirements and benefits.

Total: 45

TEXT BOOKS

1. Besterfiled, D.H., “Total Quality Management”, 3rd Edition, Pearson Education, 2004.
2. Narayana V. and Sreenivasan N.S, “Quality Management-Concepts and Tasks”, New Age International, 1996.

REFERENCES

1. Evans, J.R. and Lidsay, W.M., “The Management and Control of Quality”, 5th Edition, South-Western (Thomson Learning), 2002.
2. Feigenbaum, A.V., “Total Quality Management”, McGraw Hill, 1991.
3. Oakland, J.S., “Total Quality Management”, Butterworth-Hcinemann Ltd., 1989.

EC1301 – MICROPROCESSOR AND MICROCONTROLLER

(Common to EEE, EIE V sem., ICE V sem.)

L	T	P
3	0	0

UNIT I 8085 MICROPROCESSOR 9

8085 Architecture – Instruction set – Addressing modes – Timing diagram – Assembly language programming – Counters – Time delays – Interrupts – Memory interfacing –Interfacing I/O devices.

UNIT II PERIPHERALS INTERFACING OF 8085 9

Interfacing serial I/O (8251) – Parallel I/O (8255) – Keyboard and display controller (8279) – ADC/DAC interfacing – Inter-integrated circuits interfacing (I^2C Standard) – Bus – RS232C – RS485 – GPIB.

UNIT III 8086 MICROPROCESSOR 9

8086 architecture – 8086 addressing modes – Instruction Set – 8086 assembly language programming – Interrupts.

UNIT IV 8051 MICROCONTROLLER 9

8051 architecture – I/O pins – Ports and circuits – External memory – Counters and timers – Serial data I/O – Interrupts – Interfacing to external memory and 8255.

UNIT V 8051 PROGRAMMING AND APPLICATIONS 9

8051 instruction set – Addressing modes – Assembly language programming – I/O port programming – Timer and counter programming – Serial communication – Interrupt programming – 8051 interfacing – LCD, ADC, sensors, stepper motors, keyboard and DAC.

Total: 45

TEXT BOOKS

1. Gaonkar, R. S., "Microprocessor Architecture, Programming and application with 8085", 4th Edition, Prentice Hall, 2000.
2. Uffenbeck, J., "The 80 × 86 Families, Design, Programming and Interfacing", 3rd Edition, Pearson Education, 2002.
3. Mohammed Ali Mazidi and Janice Gillispie Mazidi, "The 8051 Microcontroller and Embedded Systems", Pearson Education, 2003.

REFERENCES

1. Ray, A.K., and Burchandi, K.M., "Intel Microprocessors Architecture Programming and Interfacing", McGraw Hill International Edition, 2000.
2. Ayala, K.J., "The 8051 Microcontroller Architecture Programming and Application", 2nd Edition, Penram International Publishers, 1996.
3. Rafiquzzaman M., "Microprocessors Theory and Applications: Intel and Motorola", Prentice Hall, 2003.

CS1203 – OBJECT ORIENTED PROGRAMMING

(Common to EEE, EIE IV sem., ICE IV sem.)

L	T	P
3	0	0

UNIT I FUNDAMENTALS 9

Object oriented programming concepts – Encapsulation – Programming elements – Program structure – Enumeration types – Functions and pointers – Function invocation – Overloading functions – Scope and storage class – Pointer types – Arrays and pointers – Call-by-reference – Assertions – Standard template library.

UNIT II IMPLEMENTING ADTS AND ENCAPSULATION 9

Aggregate type structure – Structure pointer operators – Unions – Bit fields – Data handling and member functions – Classes – Constructors and destructors – Static member – This pointer – Reference semantics – Implementation of simple ADTs.

UNIT III POLYMORPHISM 9

ADT conversions – Overloading – Overloading operators – Unary operator overloading – Binary operator overloading – Function selection – Pointer operators.

UNIT IV INHERITANCE 9

Derived class – Typing conversions and visibility – Code reuse – Virtual functions – Run-time type identifications – Exception – Handlers – Standard exceptions.

UNIT V TEMPLATES AND FILE HANDLING 9

Template class – Function templates – Class templates – C++ streams – Console streams – Console stream classes – Formatted and unformatted console I/O operations – Manipulators – File streams – Classes file modes – File pointers and manipulations – File I/O – Exception handling.

Total: 45

TEXT BOOKS

1. Ira Pohl, “Object-Oriented Programming Using C++”, Pearson Education, 2nd Edition, 2003.
2. Venugopal, K.R., Buyya, R. and Ravishankar, T., “Mastering C++”, Tata McGraw Hill, 2003.

REFERENCES

1. Ashok, B. and Kamthane, N., “Object-Oriented Programming with ANSI and Turbo C++”, Pearson Education, 2006.
2. Stroustrup, “The C++ Programming Language”, Addison Wesley, 2000.
3. Hubbard, J.R., “Programming with C++”, Schaums Outline Series, Tata McGraw Hill, 2003.

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EE1351 – POWER ELECTRONICS

(Common to EEE, EIE, ICE)

L	T	P
3	1	0

UNIT I POWER SEMICONDUCTOR DEVICES 9

Power diodes – Power transistors – MOSFET and IGBT – Construction and characteristics of SCR – Two-transistor model – Switching performance – Triggering circuits – TRIAC – Snubber circuits – Special semiconductor devices.

UNIT II PHASE-CONTROLLED CONVERTERS 9

2-pulse – 3-pulse and 6-pulse converters – Performance measures – Inverter operation of fully controlled converter – Effect of source impedance – Effect of load inductance – Single-phase AC voltage regulators – Introduction to cycloconverters.

UNIT III DC TO DC CONVERTERS 9

Step-down and step-up choppers – Time ratio control and current limit control – Switching mode regulators – Buck – Boost – Buck-Boost and cuk converter – Resonant switching based SMPS.

UNIT IV INVERTERS 9

Forced commutation techniques – Single-phase and three-phase (both 120° mode and 180° mode) inverters – PWM techniques – Voltage and harmonic control – Series resonant inverter – Voltage and current source inverters.

UNIT V APPLICATIONS 9

Uninterrupted power supply topologies – Flexible AC transmission systems – Shunt and series static VAR compensator – Unified power flow controller – HVDC transmission.

L: 45 T: 15 Total: 60

TEXT BOOKS

1. Muhammad H. Rashid, “Power Electronics: Circuits, Devices and Applications”, 3rd Edition, Pearson Education/Prentice Hall, 2004.
2. Singh, M.D. and Khanchandani, K.B., “Power Electronics”, 2nd Edition, Tata McGraw Hill, 2004.

REFERENCES

1. Bhimbra, P. S., “Power Electronics”, 4th Edition, Dhanpat Rai and Sons, 2000.
2. Bimal K. Bose, “Modern Power Electronics and AC Drives”, Pearson Education, 2003.
3. Ned Mohan, Tore M. Undeland, William P. Robbins, “Power Electronics Converters Applications and Design”, 3rd Edition, John Wiley and sons, 2003.

EE1352 – POWER SYSTEM ANALYSIS

L	T	P
3	1	0

UNIT I THE POWER SYSTEM – AN OVERVIEW AND MODELLING 9

Structure of electric power system – Current scenario – Complex power – Concepts of real and reactive power – Per phase analysis – Modeling of generator, transformer with off-nominal tap ratio, transmission line – Per unit system – One-line, Impedance and reactance diagrams – Change of base – Primitive network and network matrices – Y-bus formulation by direct inspection and singular transformation methods.

UNIT II POWER FLOW ANALYSIS 9

System model – The power flow equations (PFE) – System variables – PFE in real form – Basic problems, modified specification – Bus classification – Solution technique – Gauss-seidel method – Newton-raphson method – Fast-decoupled method – Comparison of solution techniques.

UNIT III SYMMETRICAL FAULT ANALYSIS 9

Internal voltages of loaded machines under fault conditions – Balanced three phase fault – Fault calculations using bus impedance matrix – Algorithm for formation of the impedance matrix – Selection of circuit breakers.

UNIT IV SYMMETRICAL COMPONENTS AND UNBALANCED FAULT ANALYSIS 9

Symmetrical component analysis of unsymmetrical faults – LG – LL – LLG faults – Open conductor faults – Unbalanced fault analysis using bus impedance matrix.

UNIT V POWER SYSTEM STABILITY 9

Rotor dynamics and swing equation – Stability classification – Small signal stability – Large signal stability – Equal area criterion and solution of SMIB system problems – Solution of swing equation – Point-by-point method, R-K method and modified euler method – Techniques for stability improvement.

L: 45 T: 15Total: 60

TEXT BOOKS

1. Grainger, J.J. and William D. Stevenson Jr., “Power System Analysis”, Tata McGraw Hill, 2005.
2. Gupta, B.R., “Power System Analysis and Design” S.Chand and Co., Ltd, 2005.

REFERENCES

1. Gupta, J.B., “A Course in Electrical Power” S.K.Kataria and Sons, 2002.
2. Elgerd, O.L., “Electric Energy Systems Theory” 2nd Edition, Tata McGraw Hill, 2007.
3. Ashfaq Husain “Electrical Power Systems” 4th Edition, CBS Publishers and Distributors, 1996.
4. Abhijit Chakrabarti, Sunita Halder “Power System Analysis: Operation And Control”, 2nd Edition, Prentice Hall of India, 2008.

EE1353 – HIGH VOLTAGE ENGINEERING

L	T	P
3	0	0

UNIT I OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS 9

Causes of over voltages and its effect on power system – Lightning – Switching surges and temporary over voltages – Protection against over voltages.

UNIT II ELECTRICAL BREAKDOWN IN GASES, SOLIDS AND LIQUIDS 9

Gaseous breakdown in uniform and non-uniform fields – Corona discharge – Vacuum breakdown – Conduction and breakdown in pure and commercial liquids – Breakdown mechanisms in solid and composite dielectrics.

UNIT III GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS 9

Generation of high DC, AC, impulse voltages and currents – Tripping and control of impulse generators.

UNIT IV MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS 9

Measurement of high voltages and high currents – Digital techniques in high voltage measurement.

UNIT V HIGH VOLTAGE TESTING AND INSULATION COORDINATION 9

High voltage testing of electrical power apparatus – Power frequency, impulse voltage and DC testing – International and Indian standards – Insulation coordination.

Total: 45

TEXT BOOK

1. Naidu, M.S. and Kamaraju, V, “High Voltage Engineering”, Tata McGraw Hill, 3rd Edition, 2004.

REFERENCES

1. Kuffel, E. and Zaengl, W.S., “High Voltage Engineering Fundamentals”, Pergamon Press, 1986.
2. Kuffel, E. and Abdullah, M., “High Voltage Engineering”, Pergamon Press, 1970.

CS1205 – OBJECT ORIENTED PROGRAMMING LABORATORY

L	T	P
0	0	3

1. Programs Using Functions

   - Functions with Default Arguments
   - Implementation of Call by Value, Call by Address

2. Simple Classes for understanding objects, member functions and Constructors

   - Classes with Primitive Data Members
   - Classes with Arrays as Data Members
   - Classes with Pointers as Data Members – String Class
   - Classes with Constant Data Members
   - Classes with Static Member Functions

3. Compile Time Polymorphism

   - Operator Overloading including Unary and Binary Operators
   - Function Overloading

4. Runtime Polymorphism

   - Inheritance
   - Virtual Functions
   - Virtual Base Classes
   - Templates

5. File Handling

   - Sequential Access
   - Random Access

Total: 45

EC1305 – MICROPROCESSOR AND MICROCONTROLLER LABORATORY

L	T	P
0	0	3

1. Programs for 8/16 Bit Arithmetic Operations (Using 8085)
2. Programs for Sorting and Searching (Using 8085, 8086)
3. Programs for String Manipulation Operations (Using 8086)
4. Programs for Digital Clock and Stop Watch (Using 8086)
5. Interfacing ADC and DAC
6. Parallel Communication between Two Microprocessor Kits using Mode 1 and Mode 2 of 8255
7. Interfacing and Programming 8279, 8259, and 8253
8. Serial Communication between Two Microprocessor Kits using 8251
9. Interfacing and Programming of Stepper Motor and DC Motor Speed control
10. Programming using Arithmetic, Logical and Bit Manipulation Instructions of 8051Microcontroller
11. Programming and Verifying Timer, Interrupts and UART Operations in 8051 Microcontroller
12. Communication between 8051 Microcontroller kit and PC

Total: 45

HS1301 – COMMUNICATION AND SOFT SKILLS LABORATORY

(Common to All Branches)

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UNIT I LISTENING AND SPEAKING PRACTICE IN COMMUNICATIVE FUNCTIONS

Introductions and meetings – Talking about studies and/ or job – Expressing likes and dislikes – Describing daily routines and current activities – Talking about past states and events – Talking about future plans and intentions – Expressing preferences – Giving reasons – Expressing opinions, agreement and disagreement – Seeking and giving advice – Making suggestions.

UNIT II SPEAKING APPLICATIONS

Making an oral presentation – Preparing the presentation – Performing the presentation – Beginning – Language – Visual aids and body language – Voice – Ending – Questions – Telephone conversations – Group discussion and interview.

UNIT III UNDERSTANDING AND PREPARING FOR INTERNATIONAL ENGLISH LANGUAGE EXAMINATIONS

International English Language Testing System (IELTS) – Test of English as a Foreign Language (TOEFL) – Business English Certificate (BEC).

UNIT IV SOFT SKILLS (1)

Preparing for and dealing with change – Motivation, goal-setting and self-esteem – Managing time and stress – Career and life planning – Team work – Leadership traits.

UNIT V SOFT SKILLS (2)

Multiple intelligences – Learning styles and personality typing – Critical and creative thinking – People, cultures and self – Intercultural communication.

REFERENCES

1. Kamalesh Sadanand, and Susheela Punitha, “Spoken English: A Foundation Course” for Speakers of Indian Languages, Part 2 Audio CD, Hyderabad: Orient Longman, 2008.
2. Malcome Goodale, “Professional Presentations”, (VCD) New Delhi, Cambridge University Press, 2005.
3. Barbara Garside, Tony Garside, “Essential Telephoning in English” (Audio CD), Cambridge, Cambridge University Press, 2002.
4. Hari Mohan Prasad, Rajnish Mohan, “How to Prepare for Group Discussion and Interview” (Audio Cassette) Tata McGraw-Hill Publishing.
5. “International English Language Testing System Practice Tests”, CUP.
6. “Business English Certificate Materials”, Cambridge University Press.
7. “Understanding the TOEFL”, Educational Testing Services, Princeton, US.
8. Interactive Multimedia Programs on Managing Time and Stress.
9. Robert M. Sherfield, “Developing Soft Skills” New Delhi: Pearson Education, 4th Edition, 2009.

List of activities that are to be carried out: (15 sessions x 3 periods = 45)

Lab session # 1: Listening and speaking practice exercises with communicative functions. Learning material: the ACD of Spoken English: A Foundation Course for Speakers of Indian Languages (Orient Longman, 2008)

Lab session # 2: Practice with more advanced communicative functions. Learning material: the ACD of Spoken English: A Foundation Course for Speakers of Indian Languages (Orient Longman, 2008)

Lab session # 3: Pronunciation exercises with Oxford Advanced Learners' Dictionary of Current English or any other standard Dictionary

Lab session # 4: Making an oral presentation in English. Learning Material: Professional Presentations VCD (Cambridge University Press)

Lab session # 5: Listening to telephone conversations in English and completing the tasks. Learning material: Essential Telephoning in English ACD (Cambridge University Press)

Lab session # 6: Giving an exposure to and practice with model group discussion and interviews. Learning material: How to Prepare for Group Discussion and Interview Audio Cassette (McGraw-Hill)

Lab session # 7: Giving insights into the format and the task types in the IELTS (International English Language Testing System). Learning Material: Objective IELTS, Intermediate Level (CUP)

Lab session # 8: Understanding the format and the task types in the TOEFL (Test of English as a Foreign Language). Learning Material: Understanding the TOEFL (Educational Testing Services, Princeton)

Lab session # 9: Administering the BEC (Business English Certificate) Diagnostic Test. Learning Material: BEC Practice Materials (British Council, Chennai)

Lab session # 10: Completing the steps involved in Career, Life Planning and Change Management. Learning Material: Developing Soft Skills (Pearson Education)

Lab session # 11: Setting goals and objectives exercises. Learning Material: Developing Soft Skills (Pearson Education)

Lab session # 12: Prioritizing and time planning exercises. Learning Material: Managing Time Multimedia Program CD

Lab session # 13: Taking a Personality Typing/ Psychometric Test Learning Material: 200 Psychometric Test prepared by the CUIC, Anna University Chennai

Lab session # 14: Critical and creative thinking exercises.

Lab session # 15: Improving body language and cross-cultural communication with pictures. Learning material: Body Language (S. Chand and Co.)

SEMESTER VII

POWER SYSTEM OPERATION AND CONTROL

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UNIT I GENERAL BACKGROUND AND SPEED GOVERNORS 9

General characteristics, evolution and structure of modern power systems ─ Transfer of power between active sources ─ Concept of complex power flow ─ Operating problems in power systems ─ Fundamentals of speed governing ─ Modeling of Generator, turbine, governor and load ─ Generator response to load change ─ Load response to frequency deviation ─ Governors with speed-droop characteristics: Ideal and actual – Numerical problems ─ Control of generating unit power output ─ Composite regulating characteristics of Power systems.

UNIT II FREQUENCY CONTROL AND AUTOMATIC GENERATION CONTROL 9

Importance of frequency control – Active power and frequency control ─ Primary and secondary speed control actions ─ Automatic Generation control (AGC) ─ AGC in isolated and interconnected systems ─ Concept of control area ─ Static and dynamic response of single area and two area systems ─ Numerical problems ─ Performance of AGC under normal and abnormal conditions ─ Under-frequency load shedding.

UNIT III REACTIVE POWER AND VOLTAGE CONTROL 9

Types and modeling of exciters ─ Role of exciters in voltage control ─ Voltage regulation and its relation with reactive power ─ Production and absorption of reactive power ─ Uncompensated line on open circuit and heavily loaded conditions ─ Reactive power requirement of an uncompensated line ─ Methods of voltage control ─ FACTS Controllers and applications (Simple treatment only).

UNIT IV ECONOMIC OPERATION OF POWER SYSTEMS 9

Economic considerations ─ Load curve and load-duration curve ─ Load factor, diversity factor – Numerical problems ─ Unit commitment (UC) problem ─ Constraints ─ Solution methods: Priority list method and Dynamic programming (qualitative treatment only) ─ Economic dispatch problem – Incremental cost curve ─ Coordination equations without loss and with loss(No derivation of loss coefficients) ─ Solution by direct method and λ-iteration method ─ Base point and participation factors.

UNIT V CONTROL CENTERS AND POWER SYSTEM SECURITY 9

Important control issues: small signal stability, voltage stability and blackout prevention (simple description only) ─ Introduction to power system security and reliability ─ Various operating states and control strategies ─ Control centers: aim and functions ─ SCADA and EMS ─ Contingency analysis ─ Introduction to restructuring of power systems.

L: 45 T: 15 Total: 60

TEXT BOOKS

1. Prabha Kundur, “Power System Stability and Control”, Tata Mcgraw-Hill Edition, 2006.
2. Abhijit Chakrabarti, Sunita Halder “Power System Analysis: Operation And Control”, 2nd Edition, Prentice Hall of India, 2008.

REFERENCES

1. Elgerd, O.I., “Electric Energy System Theory: An Introduction”, Tata McGraw-Hill Edition, 1983.
2. Hadi Saadat, “Power System Analysis”, Tata-McGraw Hill Edition, 2003.
3. Gupta, J.B., “A Course in Electrical Power”, S.K. Kataria Sons, 2003.
4. Allen J. Wood, Bruce F. Wollenberg, “Power Generation, Operation and Control”, John Wiley and Sons, Inc., 2003.

OPERATIONS RESEARCH

(Common to EEE, EIE and ICE)

L	T	P
3	1	0

UNIT I LINEAR PROGRAMMING (LP) 9

Basic concepts and scope of OR – Phases of OR – Formulation of LP Problems – Limitations of LP – Solutions to LPP – Graphical Solution – Standard LP form and its Basic solutions – The simplex algorithm – Artificial Variable Technique – Big-M method, Two-phase method – Variants of the Simplex Method – Degeneracy, unbounded solution, infeasible solution – Application for business and Industrial problems

UNIT II DUALITY, TRANSPORTATION MODEL AND ASSIGNMENT MODEL 9

Primal – Dual models – Dual simplex method – Mathematical formulation of the problem – Methods for finding an initial solution – North-West corner method, Least-cost method, Vogel's Approximation Method (VAM) – Test for optimality – Variants of the transportation problem – Mathematical Formulation of the problem – Solution of an assignment problem – Hungarian algorithm – Variants of the assignment problem – Traveling salesman problem

UNIT III INTEGER DYNAMIC PROGRAMMING 9

Types – Concept of a cutting plane – Gomory's cutting plane method – Branch and bound method – Concepts – Terminology – Bellman's principle of optimality – Application in Network, allocation and inventory

UNIT IV PROJECT MANAGEMENT AND THEORY OF GAMES 9

Concept of Network – PERT, CPM – Construction of Network – Critical path analysis – Probability in PERT analysis – Cost trade-off analysis – Two-person zero-sum game – Pure strategies – Mixed strategies – Games with dominance – Solution methods of games without saddle point – Algebraic method, arithmetic method, matrix method and Graphical method

UNIT V INVENTORY CONTROL AND QUEUING 9

Deterministic model – Costs – Decision variables – EOQ – Instantaneous receipt of goods with and without shortages – Non-instantaneous receipt of goods without shortages – Price breaks – Probabilistic inventory model – Single period without setup cost – Inventory systems – Lead time – Safety stock – ROL, ROP determination – Characteristics of Queuing system – Symbols and Kendall's notation – Poisson arrival and exponential service – Single and multi channel model – Infinite population

L: 45 T: 15 Total: 60

TEXT BOOKS

1. Sharma, J.K., "Operations Research: Theory and applications", Macmillan India Ltd., Reprint, 2003.
2. Hamdy A. Taha, "Operations Research – An Introduction", 7th Edition, Prentice Hall of India, 2002.

REFERENCES

1. Don, T. Philips, Ravindran, A. and James Solnerg, "Operations Research: Principles and Practice", John Wiley and Sons, 1986.
2. Bobby Srinivasan and Sandblom, C.L., "Quantitative Analysis for Business Decisions", Tata McGraw Hill Edition, 1989.
3. Chandrasekara Rao, Shanti Lata Misra, "Operations Research", Alpha Science International Ltd, 2005.
4. Nita H. Shah, Ravi M. Gor, Hardik Soni, "Operations Research", Prentice Hall of India, 2007.

POWER SYSTEM PROTECTION AND SWITCHGEAR

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3	0	0

UNIT I PROTECTION AGAINST OVER-VOLTAGES 9

Over voltages and Switching surges – Over voltage due to lightning – Klydonograph – Protection of transmission lines against direct lightning strokes – Protection of substations from direct strokes – Protection against traveling waves – Peterson coil – Insulation coordination – Basic impulse insulation level.

UNIT II CIRCUIT BREAKERS 9

Switchgear fundamentals – Arc voltage – Arc interruption – Restriking and recovery voltage – Resistance switching – Current chopping – classification of circuit breakers – Oil, Air-blast, SF6,Vacuum circuit breaker – Operating mechanism – Introduction to HVDC circuit breaker – Selection and testing of Circuit breakers.

UNIT III HRC FUSES AND SWITCHES 9

Fuse characteristics ─ Selection of fuses – Applications – Discrimination ─ HRC fuses ─ Construction ─ Action of HRC fuses ─ Types of isolators and earthing switches ─ Typical substation connections with protective switchgear and layout – Gas insulated substation – Pantographic switches

UNIT IV ALTERNATOR AND TRANSMISSION LINE PROTECTION 9

Stator protection ─ Percentage differential protection ─ Protection against stator internal faults – Stator overheating protection – Rotor protection – Field ground–fault protection – Loss of excitation – Rotor overheating protection – Protection against Over-voltage, Over-speed, Motoring, Vibration and distortion of rotor, Voltage regulator failure, field suppression – Protection of feeder and ring main system – Earth fault protection – Introduction to distance protection of HV and EHV lines – Pilot wire protection – Carrier current protection

UNIT V PROTECTIVE RELAYS 9

Electromagnetic relays – Over current, Directional, Distance and Differential relays – Under frequency relays – Introduction to Microprocessor-based Over-current relays – Generalized Mathemaical expression for Distance relays – Generalized Interface for Distance relays – Microprocessor Implementation of Digital Distance Relaying Algorithms.

Total: 45

TEXT BOOKS

1. Sunil S. Rao., “Protection and Switch Gear”, 4th Edition, Khanna Publishers, 1990.
2. Badri Ram and Viswakarma, D.N. , “Power System protection and switch gear”, Tata McGraw-Hill Publishing Company Ltd., 2001.

REFERENCES

1. Ravindranath, B. and Chander, N., “Power System Protection and Switch Gear”, New Age International (P) Ltd, Reprint 1996.
2. Sunil S. Rao, ‘Switchgear and Protection’, Khanna publishers, 1986.
3. Uppal, S.L., “Electric Power”, 13th Edition, Khanna Publishers, 1997.
4. Singh, L.P., “Digital Protection: Protective Relaying from Electromechanical to Microprocessor” Wiley, 1995
5. Paithankar, Y.G. and Bhide, S.R., “Fundamentals of Power System Protection”, Prentice Hall of India, 2003.

SOLID STATE DRIVES

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UNIT I FUNDAMENTALS OF ELECTRIC DRIVES 9

Advantage of Electric Drives – Parts and choice of Electrical Drives – Status of DC and AC drives – Torque-speed characteristics of motor and load – Selection of Motor power rating – Thermal model of motor for heating and cooling – Classes of duty cycle – Determination of motor rating – Control of Electric drives – Modes of operation – Speed control and drive classifications – Closed loop control of drives.

UNIT II CONVERTER / CHOPPER FED DC MOTOR DRIVE 9

Steady state and transient analysis of the single and three phase fully controlled converter fed separately excited D.C motor drive – Continuous and discontinuous conduction mode – Multiquadrant operation – Converter control – Chopper-fed D.C drive – Steady-state analysis – Block diagram of closed loop dc drive.

UNIT III INDUCTION MOTOR DRIVES 9

Analysis and performance of three-phase induction motor – Operation with unbalanced source voltage, single-phasing and unbalanced rotor impedance – Starting – Braking – Transient analysis – Stator voltage control –Adjustable frequency control of VSI and CSI fed induction motor – Static rotor resistance control – Slip-power recovery drives – Open loop V/f control – Principle of vector control – Vector control of induction motor – Block diagram of closed loop drive.

UNIT IV SYNCHRONOUS MOTOR DRIVES 9

Open loop V/f control and self-control of CSI and VSI fed synchronous motor – Cycloconverter fed synchronous motor – Microprocessor based synchronous motor control –Marginal angle control and power factor control – Permanent magnet (PM) synchronous motor – vector control of PM Synchronous Motor (PMSM).

UNIT V BLDC, STEPPER AND SWITCHED RELUCTANCE MOTOR DRIVES 9

Brushless DC motor drives and its applications – Variable reluctance and permanent magnet stepper motor Drives – Operation and control of switched reluctance motor – Applications, modern trends in industrial drive.

Total: 45

TEXT BOOKS

1. Bimal K. Bose, “Modern Power Electronics and AC Drives”, Pearson Education, 2002.
2. Dubey, G.K., “Fundamentals of Electrical Drives”, 2nd Edition, Narosa Publishing House, 2001.

REFERENCES

1. Pillai, S.K., “A First Course on Electrical Drives”, Wiley Eastern Limited, 1993.
2. Krishnan, R., “Electric Motor and Drives Modelling, Analysis and Control”, Prentice Hall of India, 2001.

POWER SYSTEM SIMULATION LABORATORY

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1. Computation of line parameters and Modeling of Transmission Lines using MATLAB
2. Formation of Bus Admittance and Impedance Matrices and Solution of Networks using MATLAB
3. Load Flow Analysis I – Solution of Load Flow and Related Problems Using Gauss-Seidel Method using MATLAB
4. Load Flow Analysis II – Solution of Load Flow and Related Problems Using Newton-Raphson and Fast-Decoupled Methods using MATLAB
5. Fault Analysis of AC Power System using PSCAD/EMTDC
6. Transient and Small Signal Stability Analysis: Single-Machine Infinite Bus System using SIMULINK
7. Transient Stability Analysis of Multi-machine Power Systems using MATLAB
8. Electromagnetic Transients in Power Systems using EMTP
9. Load-Frequency Dynamics of Single-Area and Two-Area Power Systems using SIMULINK
10. Economic Dispatch in Power Systems using MATLAB
11. Modeling of FACTS devices using SIMULINK

Total: 45

POWER ELECTRONICS AND DRIVES LABORATORY

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1. Single Phase Semi-converter with R-L and R-L-E loads for continuous and discontinuous conduction modes.
2. Single phase full-converter with R-L and R-L-E loads for continuous and discontinuous conduction modes.
3. Three phase full-converter with R-L-E load.
4. MOSFET, IGBT based Choppers.
5. IGBT based Single phase inverters.
6. Volts/Hz control of VSI fed three phase induction motor drive.
7. Single phase AC voltage controller.
8. Mathematical Modeling and Simulation of closed loop speed control of converter fed DC motor drive.
9. Mathematical Modeling and Simulation of closed loop speed control of chopper fed DC motor drive.
10. Simulation of closed speed control of VSI fed three phase induction motor drive using PSIM
11. Simulation of three-phase synchronous motor drive using PSIM.

Total: 45

SEMESTER VIII

RENEWABLE ENERGY SOURCES

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UNIT I ENERGY SCENARIO 9

Classification of energy sources – Energy resources: Conventional and non-conventional –Energy needs of India – Energy consumption patterns – Worldwide Potentials of these sources – Energy efficiency – Energy security – Energy and its environmental impacts – Global environmental concern – Kyoto Protocol – Concept of Clean Development Mechanism (CDM) and Prototype Carbon Funds (PCF) – Factors favoring and against renewable energy sources – IRP.

UNIT II SOLAR ENERGY 9

Solar thermal Systems – Types of collectors – Collection systems – Efficiency calculations – Applications – Photo Voltaic (PV) technology – Present status – Solar cells – Cell technologies – Characteristics of PV systems – Equivalent circuit – Array design – Building integrated PV system and its components – Sizing and economics – Peak power operation – Standalone and grid interactive systems.

UNIT III WIND ENERGY 9

Wind Energy – Wind speed and power relation – Power extracted from wind – Wind distribution and wind speed predictions – Wind power systems – System components – Types of Turbine – Turbine rating – Choice of generators – Turbine rating – Electrical load matching – Variable speed operation – Maximum power operation – Control systems – System design features – Standalone and grid connected operation.

UNIT IV OTHER ENERGY SOURCES 9

Biomass – Various resources – Energy contents – Technological advancements – Conversion of biomass in other form of energy – solid, liquid and gases – Gasifiers – Biomass fired boilers – Cofiring – Generation from municipal solid waste – Issues in harnessing these sources – Hydro energy – Feasibility of small, mini and micro hydel plants: scheme, layout and economics – Tidal and wave energy – Geothermal and Ocean-Thermal Energy Conversion (OTEC) systems – Schemes, feasibility and viability.

UNIT V ENERGY STORAGE AND HYBRID SYSTEM CONFIGURATIONS 9

Energy storage – Battery – Types – Equivalent circuit – Performance characteristics – Battery design – Charging and charge regulators – Battery management – Fly wheel energy relations – Components – Benefits over battery – Fuel cell energy – Storage systems – Ultra capacitors.

Total: 45

TEXT BOOKS

1. Rai, G. D., “Non Conventional Energy Sources”, Khanna Publishers, 1993.
2. Rao S. Paruklekar, “Energy Technology – Non Conventional, Renewable and Conventional”, Khanna Publishers, 1999.

REFERENCES

1. Openshaw Taylor, E., “Utilisation of Electric Energy in SI Units.”, Orient Longman Ltd, 2007.
2. Uppal, S.L., “Electric Power”, 13th Edition, Khanna Publishers, 1997.
3. Mukund R. Patel, “Wind and Solar Power Systems”, CRC Press LLC, 1999.

ELECTRIC ENERGY GENERATION, CONSERVATION AND UTILIZATION

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3	0	0

UNIT I GENERATION 9

Generation of electrical power by conventional methods: A brief review – Electrical systems in Aircrafts and Ships – Distributed Generation (DG): Prospects and challenges – Effect of DG on system operation.

UNIT II CONSERVATION 9

Economics of generation – Definitions – Load curves – Number and size of units – Cost of electrical energy – Tariff – Need for electrical energy conservation – Methods – Energy efficient equipment – Energy management – Energy auditing – Economics of power factor improvement – Design for improvement of power factor using power capacitors – Power quality – Effect on conservation.

UNIT III ILLUMINATION AND ELECTROLYTIC PROCESSES 9

Nature of radiation –Solid and Plane angle – Definition – Basic Laws – Photometry – Lighting Schemes – Lighting calculations – Design of illumination systems (for residential, industrial, commercial, health care, street lighting, sports, administrative complexes) – Types of lamps – Energy efficiency lamps – Design of choke and capacitor – Electrolytic Process – Basic principles – Electro-deposition – Extraction and refining of metals methods – Power supply for electrolytic processes.

UNIT IV ELECTRIC TRACTION 9

Basic concepts of Electric Traction – Requirements of an ideal traction system – Supply systems – Mechanics of train movement – Traction motors and control – Multiple units – Braking – Current collection systems – Recent trends in electric traction.

UNIT V ELECTRIC HEATING AND WELDING 9

Introduction – Methods of heating – requirement of heating material – Design of heating element – Electric Arc Furnaces – Induction Heating – Dielectric Heating – Electric Welding –Types of Resistance welding – Welding transformer and its characteristics – Thyristorised Control circuit for welding – Energy storage system for welding.

Total: 45

TEXT BOOKS

1. Uppal, S.L. and Rao, S., “Electrical Power Systems”, Khanna Publishers, 2009.
2. Wadhwa, C.L., “Generation, Distribution and Utilization of Electrical Energy”, New Age International (P) Ltd, 2003.

REFERENCES

1. Partab, H., “Art and Science of Utilisation of Electrical Energy”, Dhanpat Rai and Co, 2004.
2. Gupta, B.R., “Generation of Electrical Energy”, Eurasia Publishing House (P) Ltd, 2003.
3. Rao, S., “Testing Commissioning Operation and Maintenance of Electrical Equipments”, Khanna Publishers, 2007.
4. Anne Marie Borbely, Anne Marie Borbely, Jan F Kreider., “Distributed Generation: The Power Paradigm for the New Millenium”, CRC Press, 2001.

ELECTIVE I

PROFESSIONAL ETHICS AND HUMAN VALUES

(Common to EEE, EIE and ICE)

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UNIT I HUMAN VALUES **9**

Morals, values and ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Co- operation – Commitment – Empathy – Self-confidence – Character – Spirituality

UNIT II ENGINEERING ETHICS **9**

Senses of Engineering Ethics – Variety of moral issued – Types of inquiry – Moral dilemmas – Moral autonomy – Kohlberg's theory – Gilligan's theory – Consensus and controversy – Models of professional roles – Theories about right action – Self-interest – Customs and religion – Uses of ethical theories

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION **9**

Engineering as experimentation – Engineers as responsible experimenters – Codes of ethics – A balanced outlook on law – The challenger case study

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS **9**

Safety and risk – Assessment of safety and risk – Risk benefit analysis and reducing risk – The three mile island and Chernobyl case studies – Collegiality and loyalty – Respect for authority – Collective bargaining – Confidentiality – Conflicts of interest – Occupational crime – Professional rights – Employee rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT V GLOBAL ISSUES **9**

Multinational corporations – Environmental ethics – Computer ethics – Weapons development – Engineers as Managers – Consulting Engineers – Engineers as expert witnesses and advisors – Moral leadership – Sample code of ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of Electronics and Telecommunication Engineers(IETE), India, etc.

Total: 45

TEXT BOOKS

1. Mike Martin, Roland Schinzinger, “Ethics in Engineering”, McGraw Hill, 1996.
2. Govindarajan, M., Natarajan, S. and Senthil Kumar V. S., “Engineering Ethics”, Prentice Hall of India, 2004.

REFERENCES

1. Charles D. Fleddermann, “Engineering Ethics”, Pearson Education / Prentice Hall, 2004.
2. Charles E. Harris, Michael S. Protchard and Michael J. Rabins, “Engineering Ethics – Concepts and Cases”, Wadsworth Thompson Learning, 2000.
3. John R. Boatright, “Ethics and the Conduct of Business”, Pearson Education, 2003.
4. Edmund G. Seebauer and Robert L. Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, 2001.

SPECIAL ELECTRICAL MACHINES

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UNIT I AC COMMUTATOR MOTORS 9

Principle of operation – Equivalent circuit – Phasor diagram – Performance of Repulsion motor and Universal motor.

UNIT II STEPPER MOTORS 9

Constructional features – Principle of operation – Variable reluctance motor – Single and Multi stack configurations – Permanent Magnet Stepper motor – Hybrid stepper motor – Different modes of excitation – Theory of torque predictions – Linear and non-linear analysis – Characteristics – Drive circuits.

UNIT III SWITCHED RELUCTANCE MOTORS 9

Constructional features – Principle of operation – Torque prediction – Power controllers – Nonlinear analysis – Microprocessor based control – Characteristics – Computer control.

UNIT IV PERMANENT MAGNET MOTORS 9

Principle of operation – Types – Magnetic circuit analysis – EMF and Torque equations – Power Controllers – Motor characteristics and control of PMDC, PMSM, and BLDC motors.

UNIT V LINEAR MOTORS 9

Linear Induction motor (LIM) classification – Construction – Principle of operation – Concept of current sheet – Goodness factor – DC Linear motor (DCLM) types – Circuit equation – DCLM control applications – Linear Synchronous motor (LSM) – Types – Performance equations – Applications.

Total: 45

TEXT BOOK

1. Miller, T. J. E., “Brushless Permanent Magnet and Reluctance Motor Drives”, Clarendon Press, 1989.
2. Taylor, E.O., “The Performance and Design of AC Commutator Motors”, Sir Issac Pitman and Sons, 1998.

REFERENCES

1. Kenjo, T., “Stepping Motors and their Microprocessor Controls”, Clarendon Press, 1984
2. Naser, A. and Boldea. L., “Linear Electric Motors: Theory Design and Practical Applications”, Prentice Hall of India, 1987.
3. Murphy, J.M.D., “Power Electronics Control of AC Drives”, Pergamon Press, 1988.
4. Bose, B.K., “Power Electronics and Variable Frequency Drives”, Prentice Hall of India, 1987.

MODERN CONTROL SYSTEMS

(Common to EEE and EIE)

L	T	P
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UNIT I STATE SPACE ANALYSIS OF CONTINUOUS TIME SYSTEMS 9

State variable representation – Conversion of state variable form to transfer function and vice versa – Eigenvalues and Eigenvectors – Solution of state equation – Controllability and observability – Pole placement design – Design of state observer

UNIT II z-TRANSFORM AND SAMPLED DATA SYSTEMS 9

Sampled data theory – Sampling process – Sampling theorem – Signal reconstruction – Sample and hold circuits – z-Transform – Theorems on z-Transforms – Inverse z-Transforms – Discrete systems and solution of difference equation using z transform – Pulse transfer function – Response of sampled data system to step and ramp Inputs – Stability studies – Jury's test and bilinear transformation

UNIT III STATE SPACE ANALYSIS OF DISCRETE TIME SYSTEMS 9

State variables – Canonical forms – Digitalization – Solution of state equations – Controllability and Observability – Effect of sampling time on controllability – Pole placement by state feedback – Linear observer design – First order and second order problems

UNIT IV NONLINEAR SYSTEMS 9

Types of nonlinearity – Typical examples – Phase-plane analysis – Singular points – Limit cycles – Construction of phase trajectories – Describing function method – Basic concepts – Dead Zone – Saturation – Relay – Backlash – Liapunov stability analysis – Definiteness of scalar functions – Quadratic forms – Second method of Liapunov – Liapunov stability analysis of linear time invariant systems and non-linear system

UNIT V MIMO SYSTEMS 9

Models of MIMO system – Matrix representation – Transfer function representation – Poles and Zeros – Decoupling – Introduction to multivariable Nyquist plot and singular values analysis – Model predictive control

Total: 45

TEXT BOOKS

1. Gopal, M., "Digital Control and State Variable Methods", 3rd Edition, Tata McGraw Hill, 2008.
2. Gopal, M., "Modern Control Engineering", New Age International, 2005.

REFERENCES

1. Richard C. Dorf and Robert H. Bishop, "Modern Control Systems", 8th Edition, Pearson Education, 2004.
2. Gopal, M., "Control Systems: Principles and Design", 2nd Edition, Tata McGraw Hill, 2003.
3. Katsuhiko Ogata, "Discrete-Time Control Systems", Pearson Education, 2002.

ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

(Common to EEE, EIE and ICE)

L	T	P
3	0	0

UNIT I ARTIFICIAL INTELLIGENCE 9

AI – Intelligent agents – Perception – Natural language processing – Problem – Solving agents – Searching for solutions – Uniformed search strategies – Informed search strategies.

UNIT II KNOWLEDGE AND REASONING 9

Adversarial search – Optimal and imperfect decisions – Alpha, Beta pruning – Logical agents – Propositional logic – First order logic – Syntax and semantics – Using first order logic – Inference in first order logic.

UNIT III UNCERTAIN KNOWLEDGE AND REASONING 9

Uncertainty – Acting under uncertainty – Basic probability notation – Axioms of probability – Baye's rule – Probabilistic reasoning – Making simple decisions.

UNIT IV PLANNING AND LEARNING 9

Planning – Planning problem – Partial order planning – Planning and acting in non-deterministic domains – Learning decision trees – Knowledge in learning – Neural networks – Reinforcement learning – Passive and active.

UNIT V EXPERT SYSTEMS 9

Definition – Features of an Expert System – Organization – Characteristics – Prospector – Knowledge representation in expert systems – Expert system tools – MYCIN – EMYCIN

Total: 45

TEXT BOOKS

1. Stuart Russel and Peter Norvig, "Artificial Intelligence a Modern Approach", 2nd Edition, Pearson Education / Prentice Hall of India, 2003.
2. Donald A.Waterman, "A Guide to Expert Systems", Pearson Education / Prentice Hall of India, 2003.

REFERENCES

1. George F. Luger, "Artificial Intelligence – Structures and Strategies for Complex Problem Solving", 4th Edition, Pearson Education, 2002.
2. Elain Rich and Kevin Knight, "Artificial Intelligence", 2nd Edition, Tata McGraw-Hill, 1995.
3. Janakiraman, K.Sarukesi, "Foundations of Artificial Intelligence and Expert Systems", Macmillan Series in Computer Science, 2001.
4. Patterson, W., "Introduction to Artificial Intelligence and Expert Systems", Prentice Hall of India, 2003.

NETWORK ANALYSIS AND SYNTHESIS

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3	0	0

UNIT I NETWORK TOPOLOGY 9

General network analysis – Elementary concepts of network topology – Graph – Tree – Co-tree – Tree branch and link – Tie-set schedule and cut-set schedule – Loop-current and node-voltage methods – Parameter matrices – Equilibrium equations

UNIT II s-DOMAIN ANALYSIS 9

s-Domain network – Driving point and transfer impedances – Solutions of simple network equation – Initial condition in networks – Laplace transformation – Transformed circuits – Poles and zeros of a network function – Time response from pole-zero plot

UNIT III NETWORK PARAMETERS 9

Characterisation of two-port networks in terms of Z ,Y, h, ABCD and image parameters –Equivalent T and Pi circuits – Relation between two-port network parameters – Analysis of T – bridged T – Ladder and lattice networks – Transfer function of terminated two-port networks

UNIT IV ELEMENTS OF NETWORK SYNTHESIS 9

Realizability of one port – Hurwitz polynomials – positive real functions (p.r.f.) – Necessary and sufficient conditions of p.r.f – Testing of a p.r.f – Minimum p.r.f – Properties of driving point impedances – Synthesis of driving point impedance – Foster form – Synthesis of purely reactive networks in the Cauer form – Continued fraction expansion

UNIT V DESIGN OF FILTERS 9

Types of filters – Constant K-M derived and composite filters – Terminating half sections – frequency and impedance scaling – Frequency transformation – Active filters –Sensitivity – Single amplifier filters – All pass and notch filter – Butterworth filter – Higher order filters

Total: 45

TEXT BOOKS

1. Sudhakar, A. and Shyam Mohan, S.P., “Circuits and Networks Analysis and Synthesis”, Tata McGraw Hill, 1994.
2. Chakrabarti, A., “Circuit Theory-Analysis and Synthesis”, Dhanpat Rai and Sons, 1999.

REFERENCES

1. Kuo, F.F., “Network Analysis and Synthesis”, John Wiley and Sons, 1995.
2. Van Valken Barg, “Network Analysis”, John Wiley and Sons, 1996.
3. Mital, G.K., “Network Analysis”, Khanna Publishers, 1974.
4. Vasudev K. Aatre, “Network Theory and Filter Design”, Eastern Wiley Publishers, 1993.

ELECTIVE II

ADAPTIVE CONTROL

(Common to EEE, EIE and ICE)

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UNIT I INTRODUCTION 9

Introduction to adaptive control – Effects of process variations – Adaptive control schemes – Adaptive control problem – Non-parametric identification – Step response method – Impulse response method – Frequency response method

UNIT II PARAMETRIC IDENTIFICATION 9

Linear-in-parameter models – ARX – ARMAX – ARIMAX – Least square estimation – Recursive least square estimation – Extended least square estimation – Maximum likelihood estimation – Introduction to non-linear systems identification – Pseudo random binary sequence

UNIT III SELF-TUNING REGULATOR 9

Deterministic in-direct self-tuning regulators – Deterministic direct self-tuning regulators – Introduction to stochastic self-tuning regulators – Stochastic indirect self-tuning regulator

UNIT IV MODEL REFERENCE ADAPTIVE CONTROLLER 9

The MIT rule – Lyapunov theory – Design of model reference adaptive controller using MIT rule and Lyapunov theory – Relation between model reference adaptive controller and self-tuning regulator

UNIT V TUNING OF CONTROLLERS AND CASE STUDIES 9

Design of gain scheduling controller – Auto-tuning of PID regulator – Stability analysis of adaptive controllers – Application of adaptive control in chemical reactor, distillation column and variable area tank system

Total: 45

TEXT BOOK

1. Karl J. Astrom and Bjorn Wittenmark, “Adaptive Control”, 2nd Edition, Pearson Education, 2003.

REFERENCES

1. Hsia, T.C.H.A., “System Identification”, Lexington Books, 1974.
2. Stephanopoulis, G., “Chemical Process Control”, Prentice Hall of India, 1990.

AI APPLICATIONS TO POWER SYSTEMS

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UNIT I ARTIFICIAL INTELLIGENCE 9

Definition – Problem solving methods – Searching techniques – Knowledge representation – Reasoning methods – Predicate logic – Predicate calculus – Multivalue logic

UNIT II FUZZY LOGIC 9

Concepts – Fuzzy relations – Membership functions – Matrix representation – De-fuzzification methods

UNIT III ARTIFICIAL NEURAL NETWORK 9

Concepts of Neural Network – Multi-layer feed forward networks – Back propagation algorithms – Radial basis function and recurrent networks

UNIT IV EVOLUTIONARY TECHNIQUES AND HYBRID SYSTEMS 9

Concepts of genetic algorithms and evolutionary programming – Algorithms for Neuro-Fuzzy – Neuro-Genetic – Genetic-Fuzzy systems

UNIT V AI APPLICATIONS IN POWER SYSTEMS 9

Load flow – Economic load dispatch – Load forecasting – Transient stability and power system stabilizers

Total: 45

TEXT BOOKS

1. Rajasekaran, S. and Pai, G.A.V., "Neural Networks, Fuzzy Logic and Genetic Algorithm Synthesis and Applications", Prentice Hall of India, 2001.
2. Kevin Warwick, Arthur Ekwue, Raj Aggarwal, "Artificial Intelligence Techniques in Power Systems", IEE Power Engineering Series 22, 1997.

REFERENCES

1. Goldberg, D.E., "Genetic Algorithms in Search Optimization and Machine Learning", Addition Wesley Co., 1989.
2. Kosko, B., "Neural Networks and Fuzzy Systems A Dynamical Systems Approach to Machine Intelligence", Prentice Hall of India, 1992.
3. Taylor, C.W., "Power System Stability", McGraw Hill, 1994.
4. Lin, C. and Lee, G., "Neural Fuzzy Systems", Prentice Hall International Inc, 1996.

INTERNETWORKING TECHNOLOGY

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UNIT I COMPUTER NETWORKS 9

Introduction to networks – Network topology – Types of networks – Network architecture – Layering – Design issues – Client / Server model – Protocols – Bridges – Routers – Repeaters – Switches.

UNIT II BASICS OF INTERNETWORKING 9

Introduction to internetworking – Internetworking concepts and architectural model – Internet addressing – Domain Name System (DNS) – Address Resolution Protocol (ARP) – Reverse Address Resolution Protocol (RARP).

UNIT III INTERNET PROTOCOL AND ITS ROUTING 9

Introduction to IP protocol – Virtual networks – Concept of unreliable delivery – Connectionless delivery system – Purpose on internet protocol – Internet data gram – Data gram options – Introduction to routing – IP data gram – Direct and indirect delivery – Table driven IP routing – Next hop routing.

UNIT IV TRANSMISSION CONTROL PROTOCOL 9

Introduction to TCP – Properties of reliable delivery service – TCP protocol – TCP segment format – TCP connection – TCP state machine – Silly window syndrome.

UNIT V INTERNETWOKING APPLICATIONS 9

Simple Mail Transfer Protocol (SMTP) – Post Office Protocol (POP) – File Transfer Protocol (FTP) – Telnet – Simple Network Management Protocol (SNMP) – Internet security and firewall design.

Total: 45

TEXT BOOKS

1. Douglas E. Comer, “Internetworking with TCP/IP, Vol. 1”, 3rd Edition, Prentice Hall, 2001.
2. Andrew S. Tananbaum, “Computer Networks”, 4th Edition, Prentice Hall of India / Pearson Education, 2003

REFERENCES

1. Bechrouz A. Forouzan, “TCP/IP Protocol Suite”, 2nd Edition, Tata McGraw Hill, 2000.
2. William Stallings, “Data and Computer Communications”, 7th Edition, Prentice Hall of India / Pearson Education, 2003.

POWER SYSTEM DYNAMICS

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UNIT I INTRODUCTION 9

Concept and importance of stability in power system operation and design – Distinction between transient and dynamic stability – Complexity of stability problem in large system – Need for reduced models – Stability of interconnected systems.

UNIT II MACHINE MODELLING 9

Park's transformation – Flux linkage equations – Current space model – Per unit conversion – Normalizing the equations – equivalent circuit – Flux linkage state space model – Sub transient and transient inductances and time constants – Simplified models (one axis and constant flux linkage) – Steady state equations and phasor diagrams.

UNIT III MACHINE CONTROLLERS 9

Exciter and voltage regulators – Function of excitation systems – Types of excitation systems – Typical excitation system configuration – Block diagram and state space representation of IEEE type-1 excitation system – Saturation function – Stabilizing circuit – Function of speed governing systems – Block diagram and state space representation of IEEE mechanical hydraulic governor and electrical hydraulic governors for hydro turbines and steam turbines.

UNIT IV TRANSIENT STABILITY 9

State equation for multimachine simulation with one axis model – transient stability simulation of multimachine power system with one axis machine model including excitation system and speed governing system using R-K method of fourth order (Gill's technique) – Power system stabilizer.

UNIT V SMALL SIGNAL STABILITY 9

System response to small disturbances – Linear model of the unregulated synchronous machine and its modes of oscillation – Regulated synchronous machine – Linearization of the load equation for the one machine problem – Simplified linear model – Effect of excitation on small-signal stability – Approximate system representation – Supplementary stabilizing signals – Dynamic performance measure, small signal performance measures.

Total: 45

TEXT BOOKS

1. Ramanujam, R., "Power System Dynamics Analysis and Simulation", Prentice Hall of India, 2009.
2. Kundur, P., "Power System Stability and Control", McGraw Hill Inc., 1994.

REFERENCE

1. Pai, M.A. and Sauer, W., 'Power System Dynamics and Stability', Pearson Education Asia, India, 2002.
2. Anderson, P.M. and Fouad, A.A., "Power System Control and Stability", Galgotia Publications, 2003.

COMPUTER ARCHITECTURE

(Common to EEE, EIE and ICE)

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UNIT I BASIC STRUCTURE OF COMPUTERS 9

Functional units – Basic operational concepts – Bus structures – Software performance – Memory locations and addresses – Memory operations – Instruction and Instruction sequencing – Addressing modes – Assembly language – Basic I/O Operations – Stacks and Queues

UNIT II ARITHMETIC UNIT 9

Addition and Subtraction of Signed numbers – Design of Fast Adders – Multiplication of positive numbers – Signed operand multiplication – Fast multiplication – Integer division – Floating-Point Numbers and operations

UNIT III BASIC PROCESSING UNIT 9

Fundamental concepts – Execution of a complete instruction – Multiple bus organization – Hardwired control – Micro-programmed control – Pipelining – Basic concepts – Data hazards – Instruction hazards – Influence on Instruction sets – Data path and Control consideration – Superscalar operation – Performance considerations

UNIT IV I/O ORGANIZATION 9

Accessing I/O Devices – Interrupts – Direct memory access – Buses – Interface circuits – Standard I/O Interfaces (PCI – SCSI – USB)

UNIT V MEMORY SYSTEM 9

Memory Concepts – Semiconductor RAMs – ROMs – Speed, size and cost – Cache memories – Performance considerations – Virtual memories – Memory management requirements – Secondary storage

Total: 45

TEXT BOOKS

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, “Computer Organization”, 5th Edition, McGraw Hill, 2002.
2. John P Hayes, “Computer Architecture and Organization”, 3rd Edition, McGraw Hill, 1998.

REFERENCES

1. William Stallings, “Computer Organization and Architecture**:** Designing for Performance”, 6th Edition, Pearson Education, 2003.
2. David A Patterson, John L. Hennessy, “Computer Organization and Design The hardware / software interface”, 2nd Edition, Morgan Kaufmann, 2002.

ELECTIVE III

EMBEDDED SYSTEM DESIGN

(Common to EEE, EIE and ICE)

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UNIT I EMBEDDED COMPUTING 9

Basic concepts in embedded systems – Complex systems and Microprocessor – Embedded system design process – Formalisms for system design – Instruction sets – ARM processor – SHARC Processor.

UNIT II EMBEDDED COMPUTING PLATFORM 9

CPU – Programming input and output – Supervisor mode, exception and traps – Coprocessor – Memory system mechanisms – CPU performance – CPU power consumption – The CPU bus – Memory devices – I/O devices – Component interfacing – Designing with microprocessor – Development and debugging.

UNIT III PROGRAMMING DESIGN AND ANALYSIS 9

Program design – Models of program – Assembly and linking – Basic compilation techniques – Analysis and optimization of execution time – Analysis and optimization of energy, power and program size – Program validation and testing.

UNIT IV PROCESSES AND OPERATING SYSTEMS 9

Introduction – Multiple task and multiple processes – Context switching – Operating systems – Scheduling policies – Interprocess communication mechanisms – Evaluation of operating system performance – Power optimization strategies for processes.

UNIT V HARDWARE ACCELERATORS AND NETWORKS 9

CPUs and Accelerators – Accelerated system design – Distributed embedded architecture S-networks for embedded systems – Network based design – Internet enabled systems – System design techniques.

Total: 45

TEXT BOOK

1. Wayne Wolf., "Computer as Components, Principles of Embedded Computing System Design", 2nd Edition, Morgan Kaufmann Publishers, 2008.

REFERENCES

1. Arnold S.Berger, "Embedded Systems Design an Introduction to Processes, Tools and Techniques", CMP Eswar Publication, 2002.
2. David E. Simon, "An Embedded Software Primer", Pearson India Limited, 1999.

ENERGY MANAGEMENT AND ENERGY AUDIT

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UNIT I ELECTRICAL SYSTEMS 9

Electrical Systems – Supply and Demand – Economic operation – Input-output curves – Load profiling – Energy auditing – Instruments for auditing – Specific energy consumption – ECO assessment and evaluation methods – Energy economics – Reactive power – Power factor improvement – Automatic controls – Case study.

UNIT II ENERGY MONITORING 9

Energy accounting – Monitoring and control – Transformer loading – Efficiency analysis – Feeder loss evaluation – Case study – Lighting – Energy efficient light sources – Domestic – Commercial – Industrial lighting schemes and Controls – Energy conservation in lighting schemes – Luminaires – Case study.

UNIT III ENERGY EFFICIENCY 9

Electric Motors – Energy efficient control and starting – Load matching – Selection of Motors – Efficiency and load analysis – Energy efficiency – High efficiency Motors – Case study – Industrial drives – Control schemes – Variable speed drives and Energy conservation schemes – Pumps and Fans-efficient control strategies – Over sizing – Case study.

UNIT IV ENERGY CONSERVATION 9

Electric Conservation Act 2005 and its basic features – Electric loads of air conditioning and refrigeration – Energy conservation – Case study – Power consumption in compressors – Energy conservation measures – Electrolytic process – Electric heating – Furnace operation and scheduling – Co-generation and Tri-generation Schemes – Optimal operation – Case study.

UNIT V ENERGY AUDIT 9

Energy audit methodology – Efficiency of energy conversion processes – Monitoring system – Specific energy consumption – Three pronged approach – Fine tuning – Technical upgradation – Avoidable losses – Case studies of energy audit of distribution system – AC motors – Industries – Organization of energy audit activities.

Total: 45

TEXT BOOKS

1. Partab, H., “Art and Science of Utilization of Electrical Energy”, 2nd Edition, Dhanpat Rai and Sons, 2004.
2. Tripathy, S.C., “Electric Energy Utilization and Conservation”, Tata McGraw Hill Edition, 1993.

REFERENCES

1. “Practice for Energy Conservation and Cost Effective Planning in Industrial Facilities”, IEEE Inc, 1995.
2. Albert Thumann, P.W., “Plant Engineers and Managers Guide to Energy Conservation”, 7th Edition, TWI Press Inc, 1977.
3. Donald, R. W., “Energy Efficiency Manual”, Energy Institute Press.
4. Devkai., “Efficient Use of Electricity in Industries-ECQ series”, R&D Engineers, Vadodara, 2001.
5. Turner, Wayne C., “Energy Management Handbook”, 2nd Edition, The Fairmont Press Inc., 1993
6. “Energy Efficiency in Electrical Utilities – General Aspects of Energy Management and Energy Audit – Guide Books for National Certification Examination for Energy Managers and Energy Auditors”, Bureau of Energy Efficiency, Gol, Hall No.3, NBCC Tower II, Floor New Delhi-110 066.

POWER SYSTEM TRANSIENTS

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UNIT I SWITCHING TRANSIENTS 9

Source of transients – Various types of power systems transients – Effect of transients on power systems – importance of study of transients in planning – Circuit closing transients – RL circuit with sine wave drive – Double frequency transients – Observations in RLC circuit and basic transforms of the RLC circuit – Resistance switching – Equivalent circuit for the resistance switching problems – Equivalent circuit for interrupting the resistor current

UNIT II LOAD SWITCHING 9

Equivalent circuit – Waveforms for transient voltage across the load switch – normal and abnormal switching transients – Current suppression – Current chopping – Effective equivalent circuit – Capacitance switching – Effect of source regulation – Capacitance switching with a restrike – With multiple restrikes –Illustration for multiple restriking transients – Ferro resonance

UNIT III LIGHTNING TRANSIENTS 9

Causes of over voltage – Lightning phenomenon – Charge formation in the clouds – Rate of charging of thunder clouds – Mechanisms of lighting strokes – Characteristics of lightning strokes – Factors contributing to good line design – Protection afforded by ground wires – Tower footing resistance – Interaction between lightning and power system – Mathematical model for lightning

UNIT IV TRAVELLING WAVES ON TRANSMISSION LINE AND TRANSIENTS 9

Computation of transients – Transient response of systems with series and shunt lumped parameters and distributed lines – Travelling wave concept – Step response – Bewely's lattice diagram – Standing waves and natural frequencies – Reflection and refraction of travelling waves

UNIT V TRANSIENTS IN INTEGRATED POWER SYSTEM 9

The short line and kilometric fault – Distribution of voltage in a power system – Line dropping and load rejection – Voltage transients on closing and reclosing lines – Over voltage induced by faults – Switching surges on integrated system – EMTP for transient computation

Total: 45

TEXT BOOKS

1. Allan Greenwood, "Electrical Transients in Power Systems", 2nd Edition, Wiley Interscience, 1991.
2. Begamudre, R.D., "Extra High Voltage AC Transmission Engineering", 3rd Edition, NewAge International, 2009.

REFERENCE

1. Naidu, M.S. and Kamaraju, V., "High Voltage Engineering", 2nd Edition, Tata McGraw Hill, 2000.

DATA COMMUNICATION AND NETWORKS

(Common to EEE, EIE and ICE)

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UNIT I DATA COMMUNICATION 9

Introduction – Networks – Protocols and standards – Standards organizations – Line configurations – Topology – Transmission mode – Categories of networks – Inter networks – OSI model – Functions of the layers – Encoding and modulating – Digital-to-digital conversion – Analog-to-digital conversion – Digital-to-analog conversion – Analog-to-analog conversion – Transmission media – Guided media – Unguided media – Transmission impairment – Performance

UNIT II ERROR CONTROL AND DATA LINK PROTOCOLS 9

Error detection and correction – Types of errors – Detection – Vertical Redundancy Check (VRC) – Longitudinal Redundancy Check (LRC) – Cyclic Redundancy Check (CRC) – Check sum – Error correction – Data link control – Line discipline – Flow control – Error control – Data link protocols – Asynchronous protocols – Synchronous protocols – Character oriented protocols – BIT oriented protocols – Link access procedures

UNIT III NETWORKS AND SWITCHING 9

LAN – Project 802 – Ethernet – Token bus – Token ring – FDDI – MAN – IEEE 802.6 (DQDB) – SMDS – Switching: Circuit switching, Packet switching, Message switching

UNIT IV X.25, FRAME RELAY, ATM AND SONET/ SDH 9

X.25 – X.25 Layers – Frame relay: Introduction – Frame relay operation – Frame relay layers – Congestion control – Leaky bucket algorithm – Traffic control – ATM – Design goals – ATM architecture – ATM layers – ATM applications – SONET / SDH – Synchronous transport signals – Physical configuration – SONET layers – Applications

UNIT V NETWORKING DEVICES AND TCP / IP PROTOCOL SUITE 9

Networking and internetworking devices – Repeaters – Bridges – Gateways – Other devices – Routing algorithms – Distance vector routing – Link state routing – TCP / IP protocol suite – Overview of TCP/IP.Network layers – Addressing – Subnetting – Other protocols and network layers – Application layer – Domain Name System (DNS) – Telnet – File Transfer Protocol (FTP) – Trivial File Transfer Protocol (TFTP) – Simple Mail Transfer Protocol (SMTP) – Simple Network Management Protocol (SNMP)

Total: 45

TEXT BOOK

1. Behrouz A. Forouzan, “Data Communication and Networking”, 2nd Edition, Tata McGraw Hill, 2000.

REFERENCES

1. William Stallings, “Data and Computer Communication”, 8th Edition, Pearson Education / Prentice Hall of India, 2003.
2. Andrew Tannenbaum, S., “Computer Networks”, 4th Edition, Pearson Education / Prentice Hall of India, 2003.

MOBILE COMMUNICATION

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UNIT I CELLULAR CONCEPT AND SYSTEM DESIGN FUNDAMENTALS 9

Introduction to wireless communication: Evolution of Mobile Communications – Mobile radio systems – Examples – Trends in cellular radio and personal communications – Cellular concept – Frequency reuse – Channel assignment hand off – Interference and system capacity – Tracking and grade of service – Improving coverage and capacity in cellular systems

UNIT II MOBILE RADIO PROPAGATION 9

Free space propagation model – Reflection – Diffraction – Scattering – Link budget design – Outdoor propagation models – Indoor propagation models – Small scale multi-path propagation – Impulse model – Small scale multi-path measurements – Parameters of mobile multi-path channels – Types of small scale fading

UNIT III MODULATION TECHNIQUES AND EQUALIZATION 9

Modulation techniques – Minimum shift keying – Gaussian MSK – M-ary QAM – Performance of MSK modulation in slow-flat fading channels – Equalization – Survey of equalization techniques – Linear equalization – Non-linear equalization – Algorithms for adaptive equalization – Diversity Techniques – RAKE receiver

UNIT IV CODING AND MULTIPLE ACCESS TECHNIQUES 9

Coding – Vocoders – Linear predictive coders – Selection of speech coders for mobile communication – GSM coders – Multiple access techniques – FDMA – TDMA – CDMA – SDMA – Capacity of cellular CDMA

UNIT V WIRELESS SYSTEMS AND STANDARDS 9

Second generation and third generation wireless network and standards – WLL – Bluetooth – GSM – IS- 95 and DECT

Total: 45

TEXT BOOK

1. Rappaport, T.S., “Wireless Communications: Principles and Practice”, 2nd Edition, Prentice Hall of India/Pearson Education, 2003.

REFERENCES

1. Blake, R., “Wireless Communication Technology”, Thomson Delmar, 2003.
2. Lee, W.C.Y., “Mobile Communications Engineering: Theory and Applications”, 2nd Edition, McGraw Hill International, 1998.
3. Stephen G.Wilson, “Digital Modulation and Coding”, Pearson Education, 2003.

ELECTIVE IV

POWER QUALITY

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UNIT I INTRODUCTION TO POWER QUALITY 9

Terms and definitions – Overloading – Under voltage – Sustained interruption-Sags and Swells – Waveform distortion – Total Harmonic Distortion (THD) – Computer Business Equipment Manufacturers Associations (CBEMA) curve

UNIT II VOLTAGE SAGS AND INTERRUPTIONS 9

Sources of sags and interruptions – Estimating voltage sag performance – Motor starting sags – Estimating the sag severity – Mitigation of voltage sags – Active series compensators – Static transfer switches and fast transfer switches

UNIT III OVERVOLTAGES 9

Sources of over voltages – Capacitor switching – Lightning – Ferro resonance – Mitigation of voltage swells – Surge arresters – Low pass filters – Power conditioners – Lightning protection – Shielding – Line arresters – Protection of transformers and cables – Computer analysis tools for transients – PSCAD and EMTP

UNIT IV HARMONICS 9

Harmonic distortion – Voltage and current distortion – Harmonic indices – Harmonic sources from commercial and industrial loads – Locating harmonic sources – Power system response characteristics – Resonance – Harmonic distortion evaluation – Devices for controlling harmonic distortion – Passive filters – Active filters – IEEE and IEC standards

UNIT V POWER QUALITY MONITORING 9

Monitoring considerations – Power line disturbance analyzer – Power quality measurement equipment – Harmonic / spectrum analyzer – Flicker meters – Disturbance analyzer – Applications of expert system for power quality monitoring

Total: 45

TEXT BOOK

1. Roger C. Dugan, Mark F. McGranagham, Surya Santoso and H.Wayne Beaty, “Electrical Power Systems Quality”, McGraw Hill, 2003.

REFERENCE

1. PSCAD User Manual.

BIO-MEDICAL INSTRUMENTATION

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UNIT I PHYSIOLOGY AND TRANSDUCERS 9

Cell and its structure – Action and resting – Potential propagation of action potential – Sodium pump – Nervous system – CNS – PNS – Nerve cell – Synapse – Cardio pulmonary system – Physiology of heart and lungs – Circulation and respiration – Transducers – Different types – Piezo-electric – Ultrasonic – Resistive – Capacitive – Inductive transducers – Selection criteria

UNIT II ELECTRO-PHYSIOLOGICAL MEASUREMENTS 9

Basic components of a biomedical system – Electrodes – Micro, needle and surface electrodes – Amplifiers – Preamplifiers – Differential amplifiers – Chopper amplifiers – Isolation amplifier – ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms

UNIT III NON-ELECTRICAL PARAMETER MEASUREMENTS 9

Measurement of blood pressure – Cardiac output – Cardiac rate – Heart sound – Respiratory rate – Gas volume – Flow rate of CO_2, O_2 in exhaust air – pH of blood – ESR – GSR measurements – Plethysmography

UNIT IV MEDICAL IMAGING AND PMS 9

X-ray machine – Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography – Different types of biotelemetry systems and patient monitoring – Electrical safety

UNIT V ASSISTING AND THERAPEUTIC EQUIPMENT 9

Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy – Heart – Lung machine – Audio meters – Dializers

Total: 45

TEXT BOOKS

1. Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, “Bio-Medical Instrumentation and Measurements”, 2nd Edition, Pearson Education / Prentice Hall of India, 2002.
2. Khandpur, R.S., “Hand Book of Bio-Medical Instrumentation”, Tata McGraw Hill, 2003.

REFERENCES

1. Geddes, L.A. and Baker, L.E., “Principles of Applied Bio-Medical Instrumentation”, John Wiley and Sons, 1975.
2. Webster, J., “Medical Instrumentation”, John Wiley and Sons, 1995.
3. Rajarao, C. and Guha, S.K., “Principles of Medical Electronics and Bio-medical Instrumentation”, University Press (India) Ltd, Orient Longman Ltd, 2000.
4. Gupta, S.K., “Introduction to Medical Electronics”, Bharathi Bhavan, 1969.

VLSI DESIGN

(Common to EEE, EIE and ICE)

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UNIT I MOS TRANSISTOR THEORY AND PROCESS TECHNOLOGY 9

NMOS and PMOS transistors – Threshold voltage – Body effect – Design equations– Second order effects – MOS models – Small signal AC characteristics – Basic CMOS technology

UNIT II INVERTERS AND LOGIC GATES 9

NMOS and CMOS Inverters – Stick diagram – Inverter ratio – DC and transient characteristics – Switching times – Super buffers – Driving large Capacitance loads – CMOS logic structures – Transmission gates – Static CMOS design – Dynamic CMOS design

UNIT III CIRCUIT CHARACTERISATION AND PERFORMANCE ESTIMATION 9

Resistance estimation – Capacitance estimation – Inductance – Switching characteristics – Transistor sizing – Power dissipation and design margining – Charge sharing – Scaling

UNIT IV VLSI SYSTEM COMPONENTS CIRCUITS AND SYSTEM LEVEL PHYSICAL DESIGN 9

Multiplexers – Decoders – Comparators – Priority Encoders – Shift Registers – Arithmetic Circuits – Ripple Carry Adders – Carry Look Ahead Adders – High-Speed Adders –Multipliers – Physical design – Delay modeling – Cross Talk – Floor planning – Power distribution – Clock distribution – Basics of CMOS testing

UNIT V FPGA & VERILOG HARDWARE DESCRIPTION LANGUAGE 9

Introduction to FPGA – Xilinx FPGA – Xilinx 2000 – Xilinx 3000 – Overview of Digital Design with Verilog HDL – Hierarchical modeling concepts – Modules and Port definitions – Gate level modeling – Data flow modeling – Behavioral modeling

L: 45 T: 15 Total: 60

TEXT BOOKS

1. Neil, H. E. Weste and Kamran Eshraghian, “Principles of CMOS VLSI Design”, 2nd Edition, Pearson Education Asia, 2000.
2. John P. Uyemura “Introduction to VLSI Circuits and Systems”, John Wiley and Sons, Inc., 2002.
3. Samir Palnitkar, “Verilog HDL”, 2nd Edition, Pearson Education, 2004.

REFERENCES

1. Eugene D. Fabricius, “Introduction to VLSI Design”, McGraw Hill International Editions, 1990.
2. Bhasker, J., “A Verilog HDL Primer”, 2nd Edition, B. S. Publications, 2001.
3. Pucknell, “Basic VLSI Design”, Prentice Hall of India, 1995
4. Wayne Wolf, “Modern VLSI Design System on Chip”, Pearson Education, 2002

NEURAL NETWORK AND FUZZY LOGIC CONTROL

(Common to EEE, EIE and ICE)

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UNIT I NEURAL NETWORKS AND PATTERN ASSOCIATION 9

Differences between Biological and Artificial Neural Networks – Typical Architecture – Common Activation Functions – McCulloch – Pitts Neuron – Simple Neural Nets for Pattern Classification – Linear Separability – Hebb Net – Perceptron – Adaline – Madaline – Architecture – Algorithm and Simple Applications – Training Algorithms for Pattern Association – Hebb rule and Delta rule – Hetero associative – Auto associative and Iterative Auto associative Net – Bidirectional Associative Memory – Architecture – Algorithm – and Simple Applications

UNIT II NEURAL NETWROKS BASED ON COMPETITION 9

Kohonen Self Organising Maps – Learning Vector Quantization – Counter Propagation – Architecture – Algorithm and Applications

UNIT III ADAPTIVE RESONANCE AND BACKPROPAGATION NEURAL NETWORKS 9

ART1 and ART2 – Basic Operation and Algorithm – Standard Back propagation Architecture – Derivation of Learning Rules – Boltzmann Machine Learning – Architecture – Algorithm and Simple Applications

UNIT IV FUZZY SETS AND MEMBERSHIP FUNCTIONS 9

Properties and Operations on Classical and Fuzzy Sets – Crisp and Fuzzy Relations – Cardinality – Properties and Operations – Composition – Tolerance and Equivalence Relations –Simple Problems – Features of membership function – Standard forms and Boundaries – Fuzzification – Membership value assignments – Fuzzy to Crisp Conversions – Lambda Cuts for fuzzy sets and relations – De-fuzzification methods

UNIT V APPLICATIONS OF NEURAL NETWORKS AND FUZZY LOGIC 9

Applications of Neural Networks – Pattern Recognition – Image compression – Communication – Control systems – Applications of Fuzzy Logic – Fuzzy Pattern Recognition – Fuzzy Image compression – Fuzzy Logic Controllers

Total: 45

TEXT BOOKS

1. Sivanandam, S.N., Sumathi, S. and Deepa, S.N., "Introduction to Neural Networks using Matlab 6.0", Tata McGraw Hill, 2005.
2. Laurene Fausett, "Fundamentals of Neural Networks", Pearson Education, 2004.
3. Timothy Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill, 1998.

REFERENCES

1. Zimmermann, H.J., "Fuzzy Set Theory and Its Applications", Allied Publishers Ltd, 1999.
2. Klir, G.J. and Folger, T., "Fuzzy Sets, Uncertainty and Information", Prentice Hall of India, 2002.
3. Zurada, J.M., "Introduction to Artificial Neural Systems", Jaico Publishing House, 2006.
4. Mohammad H. Hassoun, "Fundamentals of Neural Networks", Prentice Hall of India, 2002.
5. Bark Kosko "Neural Networks and Fuzzy Systems" Prentice Hall of India, 1994.

ELECTRICAL SAFETY AND QUALITY

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UNIT I REVIEW OF IE RULES AND ACTS AND THEIR SIGNIFICANCE 9

Objective and scope – Ground clearances and section clearances – Standards on electrical safety – Safe limits of current – Voltage – Earthing of system neutral – Neutral shifting – Multiple earthed neutral system – Substation earthing – Safe, step, touch, transfer potential – Rules regarding first aid and fire fighting facility

UNIT II ELECTRICAL SAFETY IN RESIDENTIAL, COMMERCIAL AND AGRICULTURAL INSTALLATIONS 9

Wiring and fitting – Domestic appliances – Water tap giving shock – Shock from wet wall – Fan firing shock – Multi-storied building – Temporary installations – Agricultural pump installation – Do's and Don'ts for safety in the use of domestic electrical appliances

UNIT III SAFETY DURING INSTALLATION TESTING AND COMMISSIONING, OPERATION AND MAINTENANCE 9

Preliminary preparations – Safe sequence – Risk of plant and equipment – Safety documentation – Field quality and safety – Personal protective equipment – Safety clearance notice – Safety precautions –Safeguards for operators – Safety

UNIT IV ELECTRICAL SAFETY IN HAZARDOUS AREAS 9

Hazardous zones – Class 0, 1 and 2 – Spark, flashovers and corona discharge and functional – Requirements – Specifications of electrical plants – Equipments for hazardous locations – Classification of equipment enclosure for various hazardous gases and vapours – Classification of-equipment/enclosure for hazardous locations

UNIT V QUALITY MANAGEMENT 9

Total quality control and management – Importance of high load factor – Disadvantages of low power factor – Causes of low P.F. – power factor improvement – Equipments – Importance of P.F. improvement

Total: 45

TEXT BOOK

1. Rao, S. and Saluja, H.L., "Electrical Safety, Fire Safety Engineering and Safety Management", Khanna Publishers, 1988.
2. Pradeep Chaturvedi, "Energy Management Policy, Planning and Utilization", Concept Publishing Company, 1997.

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1. Nagrath, I.J. and Kothari, D.P., "Power System Engineering", Tata McGraw Hill, 1998.
2. Gupta, B.R., "Power System Analysis and Design", S.Chand and Sons, 2003.
3. Wadhwa, C.L., "Electric Power Systems", New Age International (P) Ltd., 2000.