ANNA UNIVERSITY TIRUCHIRAPPALLI
Tiruchirappalli-620024
Regulations 2007
Curriculum

B.E. ELECTRONICS AND INSTRUMENTATION ENGINEERING

SEMESTER III

S.No.	Subject Code	Subject	L	T	P	Max. Marks
Theory						
1	**MA1201**	Mathematics III	3	1	0	100
2	**HS1201**	Environmental Science and Engineering	3	0	0	100
3	**ME1210**	Thermal and Fluid Engineering	3	1	0	100
4	**EC1201**	Electronic Devices	3	1	0	100
5	**CS1201**	Data Structures	3	0	0	100
6	**EE1201**	Electric Circuits	3	1	0	100
Practical						
7	**ME1211**	Thermal and Fluid Machinery Laboratory	0	0	3	100
8	**CS1204**	Data Structures Laboratory	0	0	3	100
9	**EE1203**	Electric Circuits Laboratory	0	0	3	100

SEMESTER IV

S.No.	Subject Code	Subject	L	T	P	Max. Marks
Theory						
1	**EC1207**	Principles of Communication Engineering	3	1	0	100
2	**CS1203**	Object Oriented Programming	3	0	0	100
3	**EC1251**	Electronic Circuits	3	1	0	100
4	**EE1257**	Electrical Measurements and Instruments	3	0	0	100
5	**EE1253**	Control Systems Engineering	3	1	0	100
6	**EE1258**	Electrical Machines	3	1	0	100
Practical						
7	**EE1259**	Measurement and Instrumentation Laboratory	0	0	3	100
8	**EC1263**	Electronic Devices and Circuits Laboratory	0	0	3	100
9	**EE1260**	Electrical Machines Laboratory	0	0	3	100

SEMESTER V

S.No.	Subject Code	Subject	L	T	P	Max. Marks
Theory						
1	**MA1251**	Numerical Methods	3	1	0	100
2	**EC1307**	Digital Signal Processing	3	1	0	100
3	**EC1308**	Digital and Linear Integrated Circuits	3	0	0	100
4	**EC1301**	Microprocessors and Microcontrollers	3	1	0	100
5	**EI1301**	Transducer Engineering	3	0	0	100
6	**EI1302**	Electronic Instrumentation	3	1	0	100
Practical						
7	**EC1310**	Digital and Linear Integrated Circuits Laboratory	0	0	3	100
8	**EC1305**	Microprocessors and Microcontrollers Laboratory	0	0	3	100
9	**EI1303**	Transducer Laboratory	0	0	3	100

SEMESTER VI

S.No.	Subject Code	Subject	L	T	P	Max. Marks
Theory						
1	**MG1352**	Total Quality Management	3	0	0	100
2	**EE1351**	Power Electronics	3	1	0	100
3	**EI1351**	Analytical Instruments	3	0	0	100
4	**EI1352**	Industrial Instrumentation	3	1	0	100
5	**IC1351**	Process Control	3	1	0	100
6	**EI1353**	Fiber Optics and Laser Instruments	3	0	0	100
Practical						
7	**EI1354**	Industrial Instrumentation Laboratory	0	0	3	100
8	**IC1352**	Process Control Laboratory	0	0	3	100
9	**HS1301**	Communication and Soft Skills Laboratory	0	0	3	100

SEMESTER VII

S.No.	Subject Code	Subject	L	T	P	Max. Marks
Theory						
1	**IC1401**	Computer Control of Process	3	1	0	100
2	**EI1401**	Virtual Instrumentation	3	0	0	100
3	**EC1409**	VLSI Design	3	1	0	100
4	**MG1401**	Operations Research	3	1	0	100
5	**E1******	Elective I	3	0	0	100
6	**E2******	Elective II	3	0	0	100
Practical						
7	**EC1410**	VLSI Design Laboratory	0	0	3	100
8	**IC1402**	Computer Control of Process and Virtual Instrumentation Laboratory	0	0	3	100

SEMESTER VIII

S.No.	Subject Code	Subject	L	T	P	Max. Marks
Theory						
1	**IC1451**	Neural Network and Fuzzy Logic Control	3	0	0	100
2	**IC1452**	Distributed Control System	3	0	0	100
3	**E3******	Elective III	3	0	0	100
4	**E4******	Elective IV	3	0	0	100
Practical						
5	**EI1455**	Project	0	0	12	100

LIST OF ELECTIVES

S.No.	Subject Code	Subject	L	T	P	Max. Marks
ELECTIVE I						
1	**CS1031**	Artificial Intelligence and Expert Systems	3	0	0	100
2	**EI1001**	Modern Control Systems	3	0	0	100
3	**EE1008**	Mechatronics	3	0	0	100
4	**CS1202**	Computer Architecture	3	0	0	100
5	**GE1351**	Professional Ethics and Human Values	3	0	0	100
ELECTIVE II						
6	**EI1002**	Power Plant Instrumentation	3	0	0	100
7	**IC1001**	Adaptive Control	3	0	0	100
8	**EI1003**	Aircraft Instrumentation	3	0	0	100
9	**EI1004**	Instrumentation in Petrochemical Industries	3	0	0	100
10	**IC1002**	Optimal Control	3	0	0	100
ELECTIVE III						
11	**CS1034**	Operating Systems	3	0	0	100
12	**IC1003**	Robotics and Automation	3	0	0	100
13	**EC1018**	Embedded System Design	3	0	0	100
14	**CS1033**	Data Communication and Networks	3	0	0	100
15	**IC1004**	Industrial Drives and Control	3	0	0	100
ELECTIVE IV						
16	**EI1005**	Instrumentation in Paper Industries	3	0	0	100
17	**IC1006**	Instrumentation and Control in Power Systems	3	0	0	100
18	**EI1006**	Telemetry and Telecontrol	3	0	0	100
19	**EI1007**	Instrumentation for Pollution Control	3	0	0	100
20	**EI1008**	Instrumentation Control in Iron and Steel Industries	3	0	0	100

ANNA UNIVERSITY TIRUCHIRAPPALLI
Tiruchirappalli – 620 024
Regulations 2007

Syllabus
B.E. ELECTRONICS AND INSTRUMENTATION ENGINEERING

SEMESTER III

MA1201 – MATHEMATICS III

L	T	P
3	1	0

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 VALUEPROBLEMS 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, 987.
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
3	0	0

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.

ME1210 – THERMAL AND FLUID ENGINEERING

L	T	P
3	1	0

UNIT I LAWS OF THERMODYNAMICS 9

Thermodynamic systems – boundary – control volume – system and surroundings – universe – properties – state – process – cycle – equilibrium – work and heat transfer – point and path functions – first law of thermodynamics for open and closed systems – first law applied to a control volume – steady flow energy equations – second law of thermodynamics – heat engines – refrigerators and heat pumps – carnot cycle – carnot theorem – Clausius inequality – concept of entropy – principle of increase of entropy.

UNIT II I.C. ENGINES 9

Air standard cycles – Otto, diesel and dual cycles and comparison of efficiency – working principle of four stroke and two stroke engines – working principle of spark ignition and compression ignition engines – applications of I.C. engines – normal and abnormal combustion.

UNIT III BASIC CONCEPT OF FLUID MECHANICS 9

Introduction – classification – types of fluids – properties – laws of pressure – atmospheric – gauge – absolute pressure – pressure measurement – manometers – mechanical gauges.

UNIT IV FLOW OF FLUIDS 9

Introduction – types of fluid flow – velocity – rate equation of continuity – energy of a liquid in motion – head of a liquid – Bernoulli's theorem – orifice and mouthpiece.

UNIT V PUMPS AND TURBINES 9

Introduction – types of pumps – reciprocating pump – construction details – co-efficient of discharge – slip – power required – centrifugal pump – classification – working principle – specific speed – turbine – classification – working principle.

L: 45 T: 15 Total: 60

TEXT BOOKS

1. P.K. Nag, “Engineering Thermodynamics”, Tata McGraw-Hill, Third Edition, 2005.
2. E. Radhakrishnan, “Introduction to Fluid Mechanics”, Prentice Hall of India, 1999.

REFERENCES

1. K.L. Kumar, “Fluid Mechanics”, Eurasia publishers, 1990.
2. R.K. Rajput, “Fluid Mechanics and Hydraulic Machines”, S. Chand & Co., 1998.
3. Reynolds, “Thermodynamics”, Int. Student Edition, Tata McGraw-Hill, 1990.

EC1201 – ELECTRONIC DEVICES

L	T	P
3	1	0

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 system – 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.

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.

UNIT II LISTS – STACKS AND QUEUES **8**

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

UNIT III 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

UNIT IV SORTING **9**

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

UNIT V 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.

EE1201 – ELECTRIC CIRCUITS

L	T	P
3	1	0

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 ANDTHEOREMS 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.

L: 45 T: 15 Total: 60

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", Schaum's outline series McGraw-Hill, Fourth Edition, 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.

ME1211 – THERMAL AND FLUID MECHINERY LABORATORY

L	T	P
0	0	3

THERMAL LABORATORY

1. Valve timing and port timing diagrams for IC Engines
2. Performance test on a Petrol Engine
3. Performance test on a Diesel Engine
4. Heat Balance test on an IC Engine
5. Boiler – performance and Heat Balance Test
6. Performance test on a Refrigerator (Determination of COP)
7. Determination of heat transfer Coefficient (Free and forced convection)

FLUID MECHINERY LABORATORY

1. Flow measurements using venturimeter
2. Test to estimate frictional losses in pipe flow
3. Test on positive displacement pump for obtaining its characteristics curves and design flow parameters
4. Test on centrifugal pump for obtaining its characteristics curves and design flow parameters
5. Test on jet pump for obtaining its characteristics curves and design flow parameters
6. Test on reaction turbine for obtaining the characteristics curves and to design values of specific speed, discharge, output and efficiency
7. Test on impulse turbine to obtain its characteristics curves and hydraulic design values

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

Total: 45

EE1203 – ELECTRIC CIRCUITS LABORATORY

L	T	P
0	0	3

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

SEMESTER IV

EC1207 – PRINCIPLES OF COMMUNICATION ENGINEERING

L	T	P
3	1	0

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.

L: 45 T: 15 Total: 60

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.

CS1203 – OBJECT ORIENTED PROGRAMMING

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 struct – 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 – exceptions – 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++”, Second Edition, Pearson Education, 2003.

2. K.R.Venugopal, Rajkumar Buyya and T.Ravishankar, “Mastering C++”, Tata McGraw-Hill, 2003.

REFERENCES

1. Ashok N.Kamthane, “Object-Oriented Programming with ANSI and Turbo C++”, Pearson Education, 2006.

2 Bjarne Stroustrup, “The C++ programming language”, Addison Wesley, 2000.

3. John R.Hubbard, “Progranning with C++”, Schaums outline series, Tata McGraw-Hill, 2003.

EC1251 – ELECTRONIC CIRCUITS

L	T	P
3	1	0

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.

EE1257 – ELECTRICAL MEASUREMENTS AND INSTRUMENTS

L	T	P
3	0	0

UNIT I MEASUREMENT OF VOLTAGE AND CURRENT 9

Galvanometers – ballistic, D'Arsonval galvanometer – theory – calibration – application – principle – construction – operation and comparison of moving coil meters – moving iron meters – dynamometer – induction type and thermal type meter – rectifier type – extension of range and calibration of voltmeter and ammeter – errors and compensation.

UNIT II MEASUREMENT OF POWER AND ENERGY 9

Electrodynamometer type wattmeter – theory and errors – methods of correction – LPF wattmeter – Phantom loading – induction type KWH meter – calibration of wattmeter – energy meter.

UNIT III POTENTIOMETERS AND INSTRUMENT TRANSFORMERS 9

DC potentiometer – basic circuit – standardization – laboratory type (Crompton's) – AC potentiometer – Drysdale (polar) type – Gall-Tinsley (coordinate) type – Limitations and applications – C.T and V.T construction – theory – operation – phasor diagram – characteristics – testing – error elimination – applications.

UNIT IV RESISTANCE MEASUREMENT 9

Measurement of low, medium and high resistance – ammeter – voltmeter method – Wheatstone bridge – Kelvin double bridge – Ductor ohmmeter – series and shunt type ohmmeter – high resistance measurement – megger – direct deflection methods – Price's guard-wire method – loss of charge method – earth resistance measurement.

UNIT V IMPEDANCE MEASUREMENT 9

A.C. bridges – measurement of inductance – capacitance – Q of coil – Maxwell Bridge – Wein's bridge – Hey's bridge – Schering bridge – Anderson bridge – Campbell bridge to measure mutual inductance – errors in A.C. bridge methods and their compensation – detectors – excited field – A.C. galvanometer – vibration galvanometer – introduction to cable fault and eddy current measurement.

Total: 45

TEXT BOOKS

1. E.W. Golding and F.C. Widdis, “Electrical Measurements and Measuring Instruments”, A.H. Wheeler & Co., 1994.
2. A.K. Sawhney, “Electrical and Electronic Measurements and Instrumentation”, Dhanpat Rai & Co., 2004.

REFERENCES

1. J. B. Gupta, “A Course in Electronic and Electrical Measurements and Instrumentation”, S.K. Kataria & Sons, 2003.
2. S.K. Singh, “Industrial Instrumentation and Control”, Tata McGraw-Hill, 2003.
3. H.S. Kalsi, “Electronic Instrumentation”, Tata McGraw-Hill, 1995.
4. Martia U. Reissland, “Electrical Measurement”, New Age International Publishers, 2001.

EE1253 – CONTROL SYSTEMS ENGINEERING

L	T	P
3	1	0

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.

U N I T 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", Pearson Education/Prentice Hall of India, Fourth Edition, 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.

EE1258 – ELECTRICAL MACHINES

L	T	P
3	1	0

UNIT I D.C. MACHINES 9

Construction of D.C. machines – theory of operation of D.C. generator – characteristics of D.C. generators – armature reaction – commutation – principle of operation of D.C. motor – voltage equation – types of D.C. motor and their characteristics – speed control of D.C. motors.

UNIT II TRANSFORMER 9

Principle of transformer – ideal transformer – E.M.F. equation – constructional details of shell and core type transformer – OC and SC Test – equivalent circuit – regulation and efficiency of a transformer.

UNIT III SYNCHRONOUS MACHINES 9

Principle of alternators – construction details – equation of induced E.M.F. – vector diagram – method of starting of synchronous motor – torque developed by the motor – V-curves – speed control.

UNIT IV INDUCTION MACHINES 9

Construction – principle of operation of three phase induction motors – classification of induction motors – relation between torque and rotor power factor – equivalent circuit – performance calculation – starting and speed control.

UNIT V SPECIAL MACHINES 9

Types of single phase motor – double revolving field theory – cross field theory – capacitor start capacitor run motors – shaded pole motor – repulsion type motor – universal motor – Hysteresis motor – stepper Motor.

L: 45 T: 15 Total: 60

TEXT BOOKS

1. D.P. Kothari and I.J. Nagrath, “Electric Machines”, Tata McGraw-Hill, 2002.
2. B.L. Theraja, “A Text book of Electrical Technology”, Vol. II, S.Chand & Co., 2005.

REFERENCES

1. A.E. Fitzgerald, Charles Kingsley and Stephen D. Umans, “Electric Machinery”, Tata McGraw-Hill, 2003.
2. Smarajit Ghosh, “Electrical Machines”, Pearson Education, South Asia, 2007.
3. H. Cotton, “Advanced Electrical Technology”, Sir Isaac Pitman and Sons Ltd., London, 1971.

EE1259 – MEASUREMENTS AND INSTRUMENTATION LABORATORY

L	T	P
0	0	3

1. Use of Wheatstone bridge as resistance to voltage converter and to determine its sensitivity for various ratios
2. Kelvin Double Bridge.
3. A.C. bridges to measure Inductance and Capacitance
4. Determination of critical damping resistance of a D'Arsonval galvanometer
5. Calibration of Single Phase Energy Meter.
6. Tests on a Single Phase Energy Meter.
7. Calibration of wattmeter at different Power Factors.
8. Testing of Current Transformers.
9. Calibration of Ammeter, Voltmeter and Wattmeter using student type Potentiometer.
10. Design, construction and calibration of series and shunt type Ohmmeters.

Total: 45

EC1263 – ELECTRONIC DEVICES AND CIRCUITS LABORATORY

L	T	P
0	0	3

1. Static Characteristics of transistor under CE, CB, CC and determination of hybrid parameters
2. Static characteristics and parameter determination of JFET
3. Static characteristics of semiconductor diode, Zener diode and study of simple voltage regulator circuits
4. Static characteristics of UJT and its application as a relaxation oscillator
5. Photodiode, Phototransistor characteristics and study of light activated relay circuit.
6. Static characteristics of Thermistors
7. Single phase half wave and full wave rectifiers with inductive and capacitive filters
8. Phase shift oscillators and Wien bridge oscillators
9. Frequency response of common emitter amplifiers
10. Differential amplifiers using FET

Total: 45

EE1260 – ELECTRICAL MACHINES LABORATORY

L	T	P
0	0	3

1. Open circuit and load characteristics of separately excited and self excited D.C. generator
2. Load test on D.C. shunt motor
3. Load test on D.C. series motor
4. Swinburne's test and speed control of D.C. shunt motor
5. Load test on single phase transformer and open circuit and short circuit test on single phase transformer
6. Regulation of three phase alternator by E.M.F. and M.M.F. methods
7. Load test on three phase induction motor
8. No load and blocked rotor tests on three phase induction motor (Determination of equivalent circuit parameters)
9. Load test on single-phase induction motor
10. Study of D.C. motor and induction motor starters

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

L: 45 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

EC1301 – MICROPROCESSORS AND MICROCONTROLLERS

L	T	P
3	1	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

L: 45 T: 15 Total: 60

TEXT BOOKS

1. Ramesh S Gaonkar, "Microprocessor Architecture, Programming and application with 8085", 4th Edition, Prentice Hall of India, New Delhi, 2000
2. John Uffenbeck, "The 80x86 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-Asia, New Delhi, 2003

REFERENCES

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

EI1301 – TRANSDUCER ENGINEERING

L	T	P
3	0	0

UNIT I CALIBRATION AND ERROR ANALYSIS 9

Units and standards – Calibration methods – Static calibration – Classification of errors – Error analysis – Statistical methods – Odds and uncertainty – Classification of transducers – Selection of transducers

UNIT II CHARACTERISTICS OF TRANSDUCERS 9

Static characteristics – Accuracy – Precision – Resolution – Sensitivity – Linearity etc. – Dynamic characteristics – Mathematical model of transducer – Zero, I and II order transducers – Response to impulse, step, ramp and sinusoidal inputs

UNIT III VARIABLE RESISTANCE TRANSDUCERS 9

Principle of operation – Construction details – Characteristics and application of resistance potentiometer – Strain gauge – Resistance thermometer – Thermistor – Hot-wire anemometer – Piezoresistive sensor and humidity sensor

UNIT IV VARIABLE INDUCTANCE AND VARIABLE CAPACITANCE TRANSDUCERS 9

Induction potentiometer – Variable reluctance transducers – EI pick up – LVDT – Capacitive transducer and types – Capacitor microphone – Frequency response

UNIT V SPECIAL TRANSDUCERS 9

Piezoelectric transducer – Magnetostrictive – IC sensor – Digital transducers – Smart sensor – Fiber optic transducer

L: 45 Total: 45

TEXT BOOKS

1. Doebelin E.A., “Measurement Systems - Applications and Design”, Tata McGraw Hill, New York, 1990
2. Sawhney A.K., “A course in Electrical & Electronics Measurement and Instrumentation”, Dhanpat Rai & Co., 2004

REFERENCES

1. Patranabis D, “Sensors and Transducers”, Prentice Hall of India, 1999
2. John P. Bentley, “Principles of Measurement Systems”, 3rd Edition, Pearson Education, 2000
3. Hermann K.P. Neubert, “Instrument Transducers”, Oxford University Press, 2000
4. Murthy D.V.S., “Transducers and Instrumentation”, Prentice Hall of India, 2001
5. Ranganathan S., “Transducer Engineering”, Allied Publishers Pvt. Ltd., 2003
6. Al Sutko and J.D. Faulk, “Industrial Instrumentation”, Vikas Publications, Delhi, 1996

EI1302 – ELECTRONIC INSTRUMENTATION

L	T	P
3	1	0

UNIT I ANALOG METERS 9

D.C, A.C voltmeters – Ammeters – Multimeter – Power meter – Q-meter – True RMS meter – Vector impedance meter – Vector voltmeter – Component measuring instrument.

UNIT II SIGNAL GENERATORS AND ANALYZERS 9

Sine wave generator – Frequency synthesized sine wave generator – Sweep frequency generator, pulse and square wave generator – Function generator – Wave analyzer – Applications – Harmonic distortion analyzer – Spectrum analyzer – Applications – Audio Frequency generator – Noise generator.

UNIT III CATHODE RAY OSCILLOSCOPE 9

General purpose oscilloscope – Screens for CRT graticules – Vertical & horizontal deflection systems – Delay line – Multiple trace – Dual beam & dual trace – Probes – Oscilloscope techniques – Special oscilloscopes – Storage oscilloscopes – Sampling oscilloscope – Digital CRO.

UNIT IV DIGITAL INSTRUMENTS 9

Digital method for measuring frequency period – Phase difference – pulse width – Time interval, total count – Digital voltmeter – Types – Automatic polarity indication – Automatic ranging, auto zeroing – DMM – Microprocessor based DMM – DPM – IEEE 488 bus.

UNIT V DISPLAY AND RECORDING DEVICES 9

Bar graph display – Segmental and dot matrix display – X–Y recorders – magnetic tape recorders – Digital recording – Data loggers. Interference and screening – Electrostatic and electromagnetic interference & earth loops.

L: 45 T: 15 Total: 60

TEXT BOOKS

1. Albert D. Helfrick & William D. Cooper, “Modern Electronic Instrumentation & Measurement Techniques”, Prentice Hall of India, 2002.
2. A.J. Bouwens, “Digital Instrumentation”, Tata McGraw Hill, 1997

REFERENCES

1. B.M.Oliver and J.M.cage, “Electronic Measurements & Instrumentation”, McGraw Hill International Edition, 1975
2. Joseph. J. Carr, “Elements of Electronic Instrumentation & Measurements”, 3rd Edition, Pearson Education, 2003
3. C.S. Rangan, G.R. Sarma, V.S.V. Mani, “Instrumentation Devices & Systems”, Tata McGraw Hill, 2002
4. D. A. Bell, “Electronic Instrumentation and Measurements”, Prentice Hall of India, 2002
5. Rajendra Prasad, “Electronic Measurements and Instrumentation”, Khanna Publishers, Delhi, 2003
6. B.R. Gupta, “Electronics and Instrumentation”, S. Chand Co. (P) Ltd., Delhi, 2003

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

Total: 45

EC1305 – MICROPROCESSORS AND MICROCONTROLLERS LABORATORY

L	T	P
0	0	3

LIST OF EXPERIMENTS

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 8031 Microcontroller.
12. Communication between 8051 Microcontroller kit and PC.

Total: 45

EI1303 – TRANSDUCER LABORATORY

L	T	P
0	0	3

1. Loading effect of potentiometer
2. Strain gauge & load cell characteristics
3. Capacitive transducers
4. Photoelectric tachometer & Piezoelectric transducers
5. Hall effect transducers
6. Characteristics of LVDT
7. Characteristics of thermocouple, Thermistor and LDR
8. Step response characteristics of RTD and thermocouple
9. P/I and I/P converters
10. Digital transducer – shaft angle encoder

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.

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.

EI1351 – ANALYTICAL INSTRUMENTS

(Common to EIE, ICE)

L	T	P
3	0	0

UNIT I COLORIMETRY AND SPECTROPHOTOMETRY 9

Special methods of analysis – Beer-Lambert law – Colorimeters – UV-Vis spectrophotometers – Single and double beam instruments – Sources and detectors – IR spectrophotometers – Types– Attenuated total reflectance flame photometers – Atomic absorption spectrophotometers – Sources and detectors – FTIR spectrophotometers – Flame emission photometers.

UNIT II CHROMATOGRAPHY 9

Different techniques – Gas chromatography – Detectors – Liquid chromatographs – Applications – High-pressure liquid chromatographs – Applications.

UNIT III INDUSTRIAL GAS ANALYZERS AND POLLUTION MONITORING INSTRUMENTS 9

Types of gas analyzers – Oxygen, NO_2 and H_2S types, IR analyzers – Thermal conductivity analyzers – Analysis based on ionization of gases – Air pollution due to carbon monoxide, hydrocarbons – Nitrogen oxides – Sulphur-dioxide estimation – Dust and smoke measurements.

UNIT IV pH METERS AND DISSOLVED COMPONENT ANALYZERS 9

Principle of pH measurement – Glass electrodes – Hydrogen electrodes – Reference electrodes, selective ion electrodes and ammonia electrodes – Biosensors – Dissolved oxygen analyzer – Sodium analyzer – Silicon analyzer.

UNIT V RADIO CHEMICAL AND MAGNETIC RESONANCE TECHNIQUES 9

Nuclear radiations – Detectors – GM counter – Proportional counter – Solid state detectors – Gamma cameras – X-ray spectroscopy – Detectors – Diffractometers – Absorption meters – Detectors – NMR – Basic principles – NMR spectrometer – Applications – Mass spectrometers – Different types – Applications.

Total: 45

TEXT BOOKS

1. Khandpur, R.S., “Handbook of Analytical Instruments”, Tata McGraw Hill, 2003.
2. Willard, H.H., Merritt, L.L. Dean, J.A. and Settle, F.A., “Instrumental Methods of Analysis”, CBS Publishing and Distribution, 1995.

REFERENCES

1. Braun, R. D., “Introduction to Instrumental Analysis”, McGraw Hill, 1987.
2. Ewing, G.W., “Instrumental Methods of Analysis”, McGraw Hill, 1992.
3. Skoog, D.A. and West, D.M., “Principles of Instrumental Analysis”, Saunders Publishing, 1985.
4. Mann, C.K., Vickers, T.J. and Gullick, W.H., “Instrumental Analysis”, Harper and Row Publishers, 1974.

EI1352 – INDUSTRIAL INSTRUMENTATION

(Common to EIE, ICE)

L	T	P
3	1	0

UNIT I MEASUREMENT OF FORCE, TORQUE AND VELOCITY 9

Electric balance – Different types of load cells – Magnets – Elastic load cells – Strain gauge load cell – Different methods of torque measurement – Strain gauge, relative regular twist – Speed measurement – Revolution counter – Capacitive tacho-drag cup type tacho – D.C and A.C tacho generators – Stroboscope.

UNIT II MEASUREMENT OF ACCELERATION, VIBRATION, DENSITY AND VISCOSITY 9

Accelerometers – LVDT – Piezoelectric – Strain gauge and variable reluctance type accelerometers – Mechanical type vibration instruments – Seismic instrument as an accelerometer and vibrometer – Calibration of vibration pick-ups – Units of density – Specific gravity and viscosity used in industries – Baume scale – API scale – Pressure head type densitometer – Float type densitometer – Ultrasonic densitometer – Bridge type gas densitometer – Viscosity terms – Saybolt viscometer – Rotameter type.

UNIT III PRESSURE MEASUREMENT 9

Units of pressure – Manometers – Different types – Elastic type pressure gauges – Bourdon type bellows – Diaphragms – Electrical methods – Elastic elements with LVDT and strain gauges – Capacitive type pressure gauge – Piezo resistive pressure sensor – Resonator pressure sensor – Measurement of vacuum – McLeod gauge – Thermal conductivity gauges – Ionization gauge – Cold cathode and hot cathode types – Testing and calibration of pressure gauges – Dead weight tester.

UNIT IV TEMPERATURE MEASUREMENT 9

Definitions and standards – Primary and secondary fixed points – Calibration of thermometer – Different types of filled in system thermometer – Sources of errors – Filled in systems and their compensation – Bimetallic thermometers – Electrical methods of temperature measurement – Signal conditioning of industrial RTDs and their characteristics – Three lead and four lead RTDs.

UNIT V THERMOCOUPLES AND PYROMETERS 9

Thermocouples – Laws of thermocouple – Fabrication of industrial thermocouples – Signal conditioning of thermocouples output – Thermal block reference functions – Commercial circuits for cold junction compensation – Response of thermocouple – Special techniques for measuring high temperature using thermocouples – Radiation methods of temperature measurement – Radiation fundamentals – Total radiation and selective radiation pyrometers – Optical pyrometer – Two colour radiation pyrometers.

L: 45 T: 15 Total: 60

TEXT BOOKS

1. Doebelin, E.O., “Measurement Systems - Application and Design”, Tata McGraw Hill, 2003.
2. Jain, R.K., “Mechanical and Industrial Measurements”, Khanna Publishers, 1999.

REFERENCES

1. Patranabis, D., “Principles of Industrial Instrumentation”, Tata McGraw Hill, 1996.
2. Sawhney, A.K. and Sawhney, P., “A Course on Mechanical Measurements, Instrumentation and Control”, Dhanpat Rai and Co., 2004.
3. Nakra, B.C. and Chaudary, K.K., “Instrumentation Measurement and Analysis”, Tata McGraw Hill, 2004.
4. Singh, S.K., “Industrial Instrumentation and Control”, Tata McGraw Hill, 2003.
5. Eckman, D.P., “Industrial Instrumentation”, Wiley Eastern Ltd., 1990.

IC1351 – PROCESS CONTROL

(Common to EIE, ICE)

L	T	P
3	1	0

UNIT I MATHEMATICAL MODELLING OF PROCESSES 9

Need for process control – Mathematical model of first order liquid level and thermal processes – Higher order process – Process with dead time – Process with inverse response – Interacting and non-interacting systems – Continuous and batch process – Servo and regulator operation.

UNIT II CONTROLLER CHARACTERISTICS AND TUNING 9

Basic control action – Characteristics of on-off, proportional – Integral and derivative control modes – Composite control modes – P+I, P+D and P+I+D control modes – Electronic controllers to realize various control actions – Evaluation criteria – IAE, ISE, ITAE and ¼ decay ratio – Tuning of controllers – Ziegler-Nichol's method and cohencoon method – Damped oscillation method.

UNIT III CONTROL SYSTEMS WITH MULTIPLE LOOPS 9

Cascade control – Feed forward control – Ratio control – Selective control systems – Split range control – Adaptive and inferential control.

UNIT IV FINAL CONTROL ELEMENT 9

I/P converter – Pneumatic and electric actuators – Valve positioner – Control valves characteristics – Classification of control valves – Control valve sizing – Cavitations and flashing – Selection of control valves.

UNIT V SELECTED UNIT OPERATIONS 9

Mixing – Evaporation – Drying – Heat exchanger – Distillation process – Case study of control schemes of binary distillation column.

L: 45 T: 15 Total: 60

TEXT BOOKS

1. Donald P. Eckman, "Automatic Process Control",Wiley Eastern Ltd., 1993.
2. Stephanopoulis, G., "Chemical Process Control", Prentice Hall, 1990.

REFERENCES

1. Liptak, B.G., "Process Control", Chilton Book Company, 1994.
2. Curtis D. Johnson, "Process Control Instrumentation Technology", 7th Edition, Pearson Education / Prentice Hall of India, 2002.
3. Balchen, J.G. and Mumme, K.J., "Process Control Structures and Application", Van Nostrand Reinhold Co., 1988.

EI1353 – FIBER OPTICS AND LASER INSTRUMENTS

L	T	P
3	0	0

UNIT I OPTICAL FIBERS AND THEIR PROPERTIES 9

Principles of light propagation through a fiber – Different types of fibers and their properties – Fiber characteristics – Absorption losses – Scattering losses – Dispersion – Connectors and splicers – Fiber termination – Optical sources – Optical detectors.

UNIT II INDUSTRIAL APPLICATION OF OPTICAL FIBERS 9

Fiber optic sensors – Fiber optic instrumentation system – Different types of modulators – Interferometric method of measurement of length – Moire fringes – Measurement of pressure, temperature, current, voltage, liquid level and strain.

UNIT III LASER FUNDAMENTALS 9

Fundamental characteristics of lasers – Three level and four level lasers – Properties of laser – Laser modes – Resonator configuration – Q-switching and mode locking – Cavity damping – Types of lasers – Gas lasers – Solid lasers – Liquid lasers – Semiconductor lasers.

UNIT IV INDUSTRIAL APPLICATION OF LASERS 9

Laser for measurement of distance, length, velocity, acceleration, current, voltage and atmospheric effect – Material processing – Laser heating, welding, melting and trimming of material – Removal and vaporization.

UNIT V HOLOGRAM AND MEDICAL APPLICATIONS 9

Holography – Basic principle – Methods – Helographic interferometry and application – Holography for non-destructive testing – Holographic components – Medical applications of lasers – Laser and tissue interactive – Laser instruments for surgery – Removal of tumours of vocal cards – Brain surgery – Plastic surgery – Gynaecology and oncology.

Total: 45

TEXT BOOKS

1. Senior, J.M., “Optical Fiber Communication - Principles and Practice”, Prentice Hall, 1985.
2. Wilson. J. and Hawkes, J.F.B., “Introduction to Opto Electronics”, Prentice Hall, 2001.

REFERENCES

1. Donald J. Sterling Jr, “Technicians Guide to Fiber Optics”, 3rd Edition, Vikas Publishing House, 2000.
2. Keiser G., “Optical Fiber Communication”, McGraw Hill, 1995.
3. Gupta, S.C., “Text of Optical Fiber Communication and Applications”, Prentice Hall, 2004.

EI1354 – INDUSTRIAL INSTRUMENTATION LABORATORY

(Common to EIE, ICE)

L	T	P
0	0	3

1. Measurement of flow using Venturi meter and orifice meter
2. Calibration of Pressure gauge
3. Calibration of Temperature sensor
4. Torque measurement
5. Viscosity measurement
6. Level measurement using d/p transmitter
7. UV – visible spectrophotometer
8. pH meter standardization and measurement of pH values of solutions
9. ECG analyzer
10. Measurement of pulse rate/respiration rate

Total: 45

IC1352 – PROCESS CONTROL LABORATORY

(Common to EIE, ICE)

L	T	P
0	0	3

1. Study of interacting and non-interacting systems.
2. Response of different order processes with and without transportation lag.
3. Response of P+I+D controller.
4. Characteristics of control valve with and without positioner.
5. Closed loop response of flow control loop.
6. Closed loop response of level control loop.
7. Closed loop response of temperature control loop.
8. Closed loop response of pressure control loop.
9. Tuning of PID controller.
10. Response of cascade control system.

Total: 45

HS1301 – COMMUNICATION AND SOFT SKILLS LABORATORY

(Common to All Branches)

L	T	P
0	0	3

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.

Total:45

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, and 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

IC1401 – COMPUTER CONTROL OF PROCESS

(Common to EIE and ICE)

L	T	P
3	1	0

UNIT I ANALYSIS OF DISCRETE DATA SYSTEM 9

State-space representation of discrete time systems – Selection of sampling process – Selection of sampling period – Review of z-transform – Pulse transfer function – Modified z-transform –Stability of discrete data system – Jury's stability test and Bilinear transformation

UNIT II DESIGN OF DIGITAL CONTROLLER 9

Digital PID control– Position and velocity form – Deadbeat's algorithm – Dahlin's algorithm – Kalman's algorithm – Pole placement controller – Predictive controller

UNIT III COMPUTER AS A CONTROLLER 9

Basic building blocks of computer control system – Data acquisition systems – SCADA – Direct digital control – Introduction to AI and expert control system – Case study – Design of computerized multi-loop controller

UNIT IV PROGRAMMABLE LOGIC CONTROLLER 9

Evolution of PLC's – Components of PLC – Advantages over relay logic – PLC programming languages – Ladder diagram – Programming timers and counters – Design of PLC

UNIT V APPLICATIONS OF PLC 9

PLC Instructions – Program control instructions, math instructions – Sequencer instructions – Use of PC as PLC – Application of PLC – Case study of bottle filling system.

L: 45 T: 15 Total: 60

TEXT BOOKS

1. Deshpande, P.B. and Ash, R.H., "Computer Process Control", ISA Publication, 1995.
2. Petruzella, "Programmable Controllers", McGraw-Hill, 1989.

REFERENCES

1. Houpis, C.M. Lamount, G.B, "Digital Control Systems Theory, Hardware and Software", International Student Edition, McGraw-Hill, 1985.
2. Stephanoupoulis, G., "Chemical Process Control", Prentice Hall of India, 1990.
3. Hughes, T.A., "Programmable Controllers", 4th Edition ISA Press, 2005.
4. Singh, S.K., "Computer Aided Process Control", Prentice Hall of India, 2004.

EI1401 – VIRTUAL INSTRUMENTATION

(Common to EIE and ICE)

L	T	P
3	0	0

UNIT I REVIEW OF DIGITAL INSTRUMENTATION 9

Representation of analog signals in the digital domain – Review of quantization in amplitude and time – Sample and hold –Sampling theorem – ADC and DAC

UNIT II FUNDAMENTALS OF VIRTUAL INSTRUMENTATION (VI) 9

Concept of virtual instrumentation – PC based data acquisition – Typical on board DAQ card – Resolution and sampling frequency – Multiplexing of analog inputs – Single-ended and differential inputs – Different strategies for sampling of multi-channel analog inputs – Concept of universal DAQ card – Use of timer-counter and analog outputs on the universal DAQ card

UNIT III CLUSTER OF INSTRUMENTS IN VI SYSTEM 9

Interfacing of external instruments to a PC – RS232 – RS 422 – RS 485 – USB standards – IEEE 488 standard – ISO-OSI model for serial bus – Introduction to bus protocols of MOD bus and CAN bus

UNIT IV GRAPHICAL PROGRAMMING ENVIRONMENT IN VI 9

Concepts of graphical programming – Lab-view software – Concept of VIs and sub VI – Display types – Digital – Analog – Chart – Oscilloscopic types – Loops – Case and sequence structures – Types of data – Arrays – Formulae nodes – Local and global variables – String and file I/O

UNIT V ANALYSIS TOOLS AND SIMPLE APPLICATIONS IN VI 9

Fourier transform – Power spectrum – Correlation – Windowing and filtering tools – Simple temperature indicator – ON/OFF controller – PID controller – CRO emulation – Simulation of a simple second order system – Generation of HTML page

Total: 45

TEXT BOOKS

1. Gupta, S. and Gupta, J.P., “PC Interfacing for Data Acquisition and Process Control”, Instrument society of America, 1994.
2. Peter W. Gofton, “Understanding Serial Communications”, Sybex International, 1994.
3. Robert H. Bishop, “Learning with Lab-view”, Prentice Hall of India, 2003.

REFERENCES

1. Kevin James, “PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control”, Newnes, 2000.
2. Gary W. Johnson, Richard Jennings, “Lab-view Graphical Programming”, McGraw-Hill Professional Publishing, 2001.

EC1409 – VLSI DESIGN

(Common to EEE, EIE and ICE)

L	T	P
3	1	0

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.

MG1401 – 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.

EC1410 – VLSI DESIGN LABORATORY

(Common to EIE and ICE)

L	T	P
0	0	3

1. Study of Simulation Using Tools
2. Study of Synthesis Tools
3. Place and Root and Back Annotation for FPGAs
4. Study of Development Tool for FPGA for Schematic Entry and Verilog
5. Design of Traffic Light Controller Using Verilog and Above Tools
6. Design and Simulation of Pipelined Serial and Parallel Adder to Add/Subract 8 Bits, 12 Bits each in 2's Complement
7. Design and Simulation of Back Annotated Verilog Files for Multiplying Two Signed, 8 Bit Numbers in 2's Complement. Design must be Pipelined and Completely RTL Compliant
8. Study of FPGA Board and Testing on Board LEDs and Switches Using Verilog Codes
9. Testing the Traffic Controller Design Developed in SI. NO.5 on the FPGA Board
10. Design a Real-time Clock (2 Digits, 7 Segments LED Displays Each for HRS., MTS, and SECS.) and Demonstrate its Working on the FPGA Board (An Expansion Card is Required for the Displays)

Total: 45

IC1402 – COMPUTER CONTROL OF PROCESS AND VIRTUAL INSTRUMENTATION LABORATORY

(Common to EIE and ICE)

L	T	P
0	0	3

1. Simulation of first order system and second order with and without dead time using discretization method and Runge-Kutta method
2. Design of Discrete PID controller for a first order system
3. Study of Programmable logic controller.
4. Control of Bottle filling system using PLC.
5. Simulation of complex control systems using matlab package.
6. Operation of computer controlled liquid level system.
7. Operation of computer controlled thermal system.
8. Study of distributed control system.
9. Data Acquisition using Virtual Instrumentation from Temperature transducer.
10. Creation of a CRO using Virtual Instrumentation
11. Creation of a Digital Multi-meter using Virtual Instrumentation.
12. Design Variable Function Generator Using Virtual Instrumentation.

Total: 45

SEMESTER VIII

IC1451 – NEURAL NETWORK AND FUZZY LOGIC CONTROL

(Common to EEE, EIE and ICE)

L	T	P
3	0	0

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 – 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, Folger T, "Fuzzy Sets, Uncertainty and Information", Prentice Hall of India, 5th Indian reprint, 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.

IC1452 – DISTRIBUTED CONTROL SYSTEM

(Common to EIE and ICE)

L	T	P
3	0	0

UNIT I DATA NETWORK FUNDAMENTALS 9

Network hierarchy and switching – Open system interconnection model of ISO – Data link control protocol – BISYNC – SLDC – HLDC – Media access protocol – Command – Token passing – CSMA/CD, TCP/IP

UNIT II INTERNET WORKING 9

Bridges –Routers – Gateways – Open system with bridge configuration – Open system with gateway configuration – Standard ETHERNET and ARCNET configuration – Special requirement for networks used for control

UNIT III DISTRIBUTED CONTROL SYSTEM 9

Evolution – Architectures – Comparison – Local control unit – Process interfacing issues – Communication facilities

UNIT IV INTERFACES IN DCS 9

Operator interfaces – Low level and high level operator interfaces – Operator displays – Engineering interfaces – Low level and high level engineering interfaces – General purpose computers in DCS

UNIT V HART AND FIELD BUS 9

Evolution of signal standards – HART communication protocol – Communication modes – HART networks – Control system interface – HART and OSI model – Field bus introduction – General field bus architecture – Basic requirements of field bus standard – Field bus topology – Inter operability

Total: 45

TEXT BOOKS

1. Tanenbaum, A.S., “Computer Networks”, 3rd Edition, Pearson Education / Prentice Hall of India, 1996.
2. Michael P. Lukas, “Distributed Control System”, Van Nostrand Reinhold Co., 1986.

REFERENCES

1. McMillan.G. K., “Process/Industrial Instruments and controls Hand book”, Tata McGraw-Hill, 1999.
2. Romily Bowden, “HART application Guide and OSI communication Foundation”, 1999.
3. Buchanan, W., “Computer Buses”, Arnold Publishers, 2000.

ELECTIVE I

CS1031 – 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, Prentice Hall of India, 2003.
2. Donald A.Waterman, "A Guide to Expert Systems", Pearson Education, 2003.

REFERENCES

1. George F. Luger, "Artificial Intelligence – Structures and Strategies for Complex Problem Solving", 4th Edition, Pearson Education, 2002.
2. Elain Rich, Kevin Knight, "Artificial Intelligence", 2nd Edition, Tata McGraw-Hill, 1995.
3. Janakiraman, Sarukesi, K., "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.

EI1001 – MODERN CONTROL SYSTEMS

(Common to EEE and EIE)

L	T	P
3	0	0

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 NON-LINEAR SYSTEMS 9

Types of non linearity – 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. Katsuhiko Ogata, "Discrete-Time Control Systems", Pearson Education, 2002.
2. Nagrath, I.J. and Gopal M., "Control Systems Engineering", Wiley Eastern Ltd., 1982.
3. Gopal, M., "Digital Control and State Variable Methods", 3rd Edition, Tata McGraw-Hill, 2008.

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.

EE1008 – MECHATRONICS

(Common to EIE and ICE)

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UNIT I INTRODUCTION 9

Mechatronics – Definition and key issues – Evolution – Elements – Mechatronics approach to modern engineering design

UNIT II SENSORS AND TRANSDUCERS 9

Types – Displacement – Position – Proximity and velocity sensors – Signal processing – Data display

UNIT III ACTUATION SYSTEMS 9

Mechanical types – Applications – Electrical types – Applications – Pneumatic and hydraulic systems – Applications – Selection of actuators

UNIT IV CONTROL SYSTEMS 9

Types of controllers – Programmable logic controllers – Applications – Ladder diagrams – Microprocessor applications in mechatronics – Programming interfacing – Computer applications

UNIT V RECENT ADVANCES 9

Manufacturing mechatronics – Automobile mechatronics – Automobile mechatronics – Medical mechatronics – Office automation – Case studies

Total: 45

TEXT BOOKS

1. Bulton, N., "Mechatronics Electronic Control system for Mechanical and Electrical Engineering", Longman, 1995.
2. Dradly, D.A., Dawson, D, Burd, N.C. and Loader A.J., "Mechatronics: Electronics in Products and Processes", Chapman and Hall, 1993.

REFERENCES

1. HMT, "Mechatronics", Tata McGraw-Hill, 1968.
2. Galip Ulsoy A. and Devires W.R., "Microcomputer Applications in Manufacturing", John wiley, 1989.
3. James Harter, "Electromechanics: Principles, Concepts and Devices", Prentice Hall, 1995.

CS1202 – 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 BOOK

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, “Computer Organization”, 5th Edition, McGraw-Hill, 2002.

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.
3. John P. Hayes, “Computer Architecture and Organization”, 3rd Edition, McGraw-Hill, 1998.

GE1351 – 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, 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.

ELECTIVE II

EI1002 – POWER PLANT INSTRUMENTATION

(Common to EIE and ICE)

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UNIT I OVERVIEW OF POWER GENERATION 9

Brief survey of methods of power generation – Hydro power – Thermal power – Nuclear power-solar and wind power – Importance of instrumentation in power generation – Thermal power plants – Block diagram – Details of boiler processes – UP& I diagram of boiler – Cogeneration

UNIT II MEASUREMENTS IN POWER PLANTS 9

Electrical measurements – Current – Voltage – Power – Frequency – Power factor etc. – Non electrical parameters – Flow of feed water – Fuel – Air and steam with correction factor for temperature – Steam pressure and steam temperature – Drum level measurement – Radiation detector – Smoke density measurement – Dust monitor

UNIT III ANALYSERS IN POWER PLANTS 9

Flue gas oxygen analyzer – Analysis of impurities in feed water and steam – Dissolved oxygen analyzer – Chromatography – pH meter – Fuel analyzer – Pollution monitoring instruments

UNIT IV CONTROL LOOPS IN BOILER 9

Combustion control – Air/fuel ratio control – Furnace draft control – Drum level control – Main steam and reheat steam temperature control – Super heater control – Air temperature – Deaerator control – Distributed control system in power plants – Interlocks in boiler operation

UNIT V TURBINE – MONITORING AND CONTROL 9

Speed, vibration, shell temperature monitoring and control – Steam pressure control – Lubricant oil temperature control – Cooling system

Total: 45

TEXT BOOKS

1. Sam G. Dukelow, “The Control of Boilers”, Instrument Society of America, 1991.
2. Nag, P.K., “Power Plant Engineering”, Tata McGraw-Hill, 2001.

REFERENCES

1. Elonka, S.M. and Kohal, A.L., “Standard Boiler Operations”, Tata McGraw-Hill, 1994.
2. Jain, R.K., “Mechanical and Industrial Measurements”, Khanna Publishers, 1995.
3. Wakil, E.Al., “Power Plant Engineering”, Tata McGraw-Hill, 1984.

IC1001 – 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.

EI1003 – AIRCRAFT INSTRUMENTATION

(Common to EIE and ICE)

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UNIT I INTRODUTION **9**

Classification of aircraft instrumentation – Instrument display – Panels – Cockpit layout

UNIT II FLIGHT INSTRUMENTATION **9**

Static and pilot pressure source – Altimeter – Airspeed indicator – Vertical speed indicator – Machmeter – Maximum safe speed indicator – Accelerometer

UNIT III GYROSCOPIC INSTRUMENTS **9**

Gyroscopic theory – Directional gyro indicator – Artificial horizon – Turn and slip indicator

UNIT IV AIRCRAFT COMPUTER SYSTEMS **9**

Terrestrial magnetism – Aircraft magnetism – Direct reading magnetic compass – Compass errors – Gyro-magnetic compass

UNIT V POWER PLANT INSTRUMENTS **9**

Fuel flow – Fuel quantity measurement – Exhaust gas temperature measurement – Pressure measurement

Total: 45

REFERENCES

1. Pallet, E.H.J., “Aircraft Instruments –Principles and application”, Pitman and sons, 1981.
2. Pallet, E.H.J., “Aircraft Instrument and Integrated Systems”, Pitman and sons, 1991.

EI1004 – INSTRUMENTATION IN PETROCHEMICAL INDUSTRIES

(Common to ICE and EIE)

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UNIT I PETROLEUM PROCESSING 9

Petroleum exploration – Recovery techniques – Oil-Gas separation – Processing wet gases – Refining of crude oil

UNIT II OPERATIONS IN PETROLEUM INDUSTRY 9

Thermal cracking – Catalytic cracking – Catalytic reforming – Polymerisation – Alkylation – Isomerization – Production of ethylene, acetylene and propylene from petroleum

UNIT III CHEMICALS FROM PETROLEUM PRODUCTS 9

Chemicals from petroleum – Methane derivatives – Acetylene derivatives – Ethylene derivatives – Propylene derivatives – Other products

UNIT IV MEASUREMENTS IN PETROCHEMICAL INDUSTRY 9

Parameters to be measured in refinery and petrochemical industry – Selection and maintenance of measuring instruments – Intrinsic safety of Instruments

UNIT V CONTROL LOOPS IN PETROCHEMICAL INDUSTRY 9

Process control in refinery and petrochemical industry – Control of distillation column – Control of catalytic crackers and pyrolysis unit – Automatic control of polyethylene production – Control of vinyl chloride and PVC production

Total: 45

TEXT BOOKS

1. Waddams, A.L., “Chemicals from Petroleum”, Butter and Janner Ltd., 1968.
2. Balchan, J.G. and Mumme, K.I., “Process Control Structures and Applications”, Van Nostrand Reinhold Company, 1988.

REFERENCES

1. Austin G.T. Shreeves, “Chemical Process Industries”, McGraw Hill International Student Edition,1985.
2. Liptak, B.G., “Instrumentation in Process Industries”, Chilton Book Company, 1994.

IC1002 – OPTIMAL CONTROL

(Common to EIE and ICE)

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UNIT I INTRODUCTION 9

Statement of optimal control problem – Problem formulation and forms of optimal control – Performance measures for optimal control – Selection of performance measure – Various methods of optimization – Linear programming – Non-linear programming – Dynamic programming

UNIT II DYNAMIC PROGRAMMING 9

Principle of optimality – Recurrent relation of dynamic programming for optimal control problem – Computational procedure for solving optimal control problems – Characteristics of dynamic programming solution – Hamilton Jacobi Bellman equation – Application to a continuous linear regulator problem

UNIT III CALCULUS OF VARIATIONS 9

Fundamentals concepts – Functional of a single function – Functional involving several independent functions – Piecewise smooth extremals – Constrained extrema

UNIT IV VARIATIONAL APPROACH TO OPTIMAL CONTROL 9

Necessary conditions for optimal control – Linear regulator problems – Pontryagin's minimum principle and state inequality constraints

UNIT V APPLICATIONS OF PONTRYAGIN'S MINIMUM PRINCIPLE 9

Minimum time problem – Minimum control effort problems – Minimum fuel problem – Minimum energy problem – Singular intervals in optimal control problems

Total: 45

TEXT BOOKS

1. Sarkar, B., "Control System Design – The Optimal Approach", Wheeler Publishing, 1997.
2. Gopal, M., "Modern Control System Theory", 2nd Edition, New Age International Ltd., 1993.

REFERENCES

1. Donald E. Kirk, "Optimal Control Theory – An introduction", Pearson Education, 1970.
2. Kemin Zbou, Doyle, J.C., "Robust and Optimal Control", Pearson Education, 1996.

ELECTIVE III

CS1034 – OPERATING SYSTEMS

(Common to EIE and ICE)

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UNIT I FUNDAMENTALS **9**

Concepts – Mainframe systems – Desktop systems – Multiprocessor systems – Distributed systems – Clustered systems – Real time systems – Handheld systems – Hardware protection – System components – Operating system services – System calls – System programs

UNIT II PROCESS MANAGEMENT **9**

Process concept – Process scheduling – Operations on processes – Cooperating processes – Inter process communication – Threads – Overview – Threading issues – CPU scheduling – Basic concepts – Scheduling criteria – Scheduling algorithms – Multiple processor scheduling – Real time scheduling – The critical section problem – Synchronization hardware – Semaphores – Classic problems of synchronization – Critical regions – Monitors

UNIT III DEADLOCKS **9**

System model – Deadlock characterization – Methods for handling deadlocks – Deadlock prevention – Deadlock avoidance – Deadlock detection – Recovery from deadlocks

UNIT IV MEMORY AND FILE MANAGEMENT **9**

Storage management – Swapping – Contiguous memory allocation – Paging – Segmentation – Segmentation with paging – Virtual memory – Demand paging – Process creation – Page replacement – Allocation of frames – Thrashing – File concept – Access methods – Directory structure – File system mounting – File sharing – Protection

UNIT V FILE AND I/O SYSTEMS **9**

File system structure – File system implementation – Directory implementation – Allocation methods – Free – Space management – Kernel I/O subsystems – Disk structure – Disk scheduling – Disk management – Swap-Space management – Case Study – The Linux system – Windows

Total: 45

TEXT BOOK

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 6th Edition, John Wiley and Sons, 2003.
2. Harvey M. Deitel, “Operating Systems”, 2nd Edition, Pearson Education, 2002.

REFERENCES

1. Andrew S. Tanenbaum, “Modern Operating Systems”, Prentice Hall of India, 2003.
2. William Stallings, “Operating System”, 4th Edition, Prentice Hall of India, 2003.

IC1003 – ROBOTICS AND AUTOMATION

(Common to EIE and ICE)

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UNIT I INTRODUCTION TO ROBOTICS 9

History of Robots – Classifications – Various fields of Robotics – Actuators – Sensors – Manipulators – End effectors – Application areas – Robot programming languages

UNIT II ROBOT KINEMATICS 9

Matrix representation – Homogeneous transformation – DH representation of standard robots – Inverse kinematics

UNIT III ROBOT DYNAMICS 9

Velocity kinematics – Jacobian and inverse Jacobian – Lagrangian formulation – Eulers Lagrangian formulation – Robot equation of motion

UNIT IV TRAJECTORY PLANNING 9

Introduction – Path Vs trajectory – Joint-space Vs Cartesian-space descriptions – Basics of trajectory planning – Joint-space trajectory planning – Cartesian-space trajectories

UNIT V CONTROL AND APPLICATION OF ROBOTICS 9

Linear control of robot manipulation – Second-order systems – Trajectory following control – Modeling and control of single joint – Architecture of industrial robotic controllers – Robot applications

Total: 45

TEXT BOOKS

1. Saced B. Niku, “Introduction to Robotics Analysis, Systems, Applications”, Prentice Hall of India, 2001
2. Craig, “Introduction to Robotics Mechanics and Control”, 2nd Edition, Pearson Education, Asia, 2004

REFERENCES

1. King Sun Fu, Rafael C. Gonzalez, George Lee C. S “ROBOTICS: Control, Sensing, Vision and Intelligence”, McGraw-Hill International Editions, Industrial Engineering Series, 1991
2. Klafter R.D., Chimielewski T.A. and Negin M., “Robotic Engineering – An integrated Approach”, Prentice Hall of India,1994

EC1018 – 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.

CS1033 – 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, Prentice Hall of India, 2003
2. Andrew Tannenbaum S, “Computer Networks”, 4th Edition, Pearson Education, 2003.

IC1004 – INDUSTRIAL DRIVES AND CONTROL

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UNIT I INTRODUCTION TO ELECTRIC DRIVES 9

History and development of electric drives – Characteristics of Electrical and mechanical loads – Classification of electric drives – Basic elements and advantages of variable speed drives – Modes of operation – Closed loop control of drives – Selection of power rating for drive motors with regard to thermal overloading and load variation.

UNIT II DC DRIVES 9

Speed control of DC motors – Ward-Leonard scheme – Drawbacks – Thyristor converter-fed dc drives – Single, two and four quadrant operations – Chopper-fed DC drives – Time-ratio control and current-limit control – Single, Two and four quadrant operations – Effect of ripples

UNIT III AC DRIVES 9

Speed control of 3-phase Induction Motors – Stator control – PWM and V/f control – Rotor resistance control – Static control of rotor resistance using DC chopper – Static Krammer and Scherbius drives – Introduction to Vector Controlled Induction Motor Drives – Speed control of 3-phase Synchronous Motors – True-synchronous and self controlled modes of operations

UNIT IV RELUCTANCE MOTOR DRIVES 9

DC servo drives: principle of operation – AC servo drives: principle of operation – Principle and control of Stepper motor and SRM drives.

UNIT V DIGITAL CONTROL AND DRIVE APPLICATIONS 9

Digital techniques in speed control – Advantages and limitations – Microprocessor/Microcontroller and PLC based control of drives – Networking of drives – Selection of drives and control schemes for Steel rolling mills – Paper mills – Cement mills – Machine tools – Lifts and Cranes – Solar and battery powered drives.

Total: 45

TEXT BOOKS

1. Dubey, G .K., “Fundamentals of Electrical Drives”, Narosa Publishing House, 2003.
2. Bose, B.K., “Modern Power Electronics and AC Drives”, Pearson Education, 2003.

REFERENCES

1. Ion Boldea and Nasar, S.A., “Electric Drives”, CRC Press LLC, 1999.
2. Krishnan, R., “Electric Motor Drives: Modelling, Analysis and Control”, Prentice Hall of India, 2002.
3. Vedam Subramanyam, “Electric Drives: Concepts and Applications”, Tata McGraw-Hill, 2004.

ELECTIVE IV

EI1005 – INSTRUMENTATION IN PAPER INDUSTRIES

(Common to EIE and ICE)

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UNIT I DESCRIPTION OF THE PROCESS 9

Raw material – Basic process – Pulping process – Chemical recovery process – Paper making Process –Converting

UNIT II MEASUREMENT HARDWARE AND ANALYZERS 9

Measurement of basis weight – Sensors –Density-Specific gravity – Flow-level of liquids and solids – Detectors – Pressure – Temperature – Consistency sensors – Moisture analyzers –Oxidation – Redution Potential and pH – Graphic displays and alarms

UNIT III VALVES 9

Selection factors – Valve types – Ball, butterfly, gate, plug, pinch applications

UNIT IV CONTROL SYSTEMS 9

Blow down tank controls – Digester liquor feed pump controls – Brown stock washer level control – Stock chest level control – Basis weight control – Dryer temperature control – Dissolving tank density control – White liquor flow controls – Time storage silo level detection – Condensate conductivity control

UNIT V COMPUTER APPLICATIONS 9

Application – Control and measuring devices – Stepper motor and gear train application – Industrial robots in production lines

Total: 45

TEXT BOOKS

1. Liptak, B.G., “Instrumentation in processing Industries”, Ghilton Book, 1973.
2. Considine, D.M., “Hand book of Applied Instrumentation” Tata McGraw-Hill,1984.

REFERENCES

1 Howar P. Kallen, “Hand book of Instrumentation and Control”, Tata McGraw-Hill, 1961.
2. Robert J. Bibbero, “Microprocessors in Industrial Control” ISA Press, 1983.
3. James A. Gupton Jr., “Computer Controlled Industrial Machine Process and Robots”, Prentice Hall of India, 1986.

IC1006 – INSTRUMENTATION AND CONTROL IN POWER SYSTEMS

(Common to EIE and ICE)

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UNIT I INSTRUMENTATION AND CONTROL IN POWER GENERATION 9

Water Steam cycle fuels – steam generators – Electric power generation – Environmental conditions.

UNIT II ELECTRICAL AND PRESSURE MEASUREMENTS 9

Current – Voltage – Power-frequency – Reactive power – Maximum demand – Trivector meter – Pressure measurement: Steam pressure – Feed water pressure – Turbine head steam and de-aerator pressure – Drafts and very low pressure – Furnace draft – Uptake draft – Forced draft – Pulverizer differentials.

UNIT III TEMPERATURE AND FLOW MEASUREMENTS 9

Temperatures: Super heated steam temperature – Feed water and gas temperature – Flow – Steam flow – Fuel flow – Feed water flow – Air flow – Level: boiler drum water level – Hot well and de-aerator levels – Smoke density – pH and conductivity – Speed – Gas analysis – Steam and fuel gas sampling.

UNIT IV CONTROL OF LIQIUD LEVEL, TEMPERATURE VOLTAGE AND FREQUENCY 9

Control loop interactions – Feed water control – Drum level control – Re-circulation control – Control of reheat and steam temperature – Automatic voltage and frequency control.

UNIT V INSTRUMENTATION AND CONTROL IN ENERGY MANAGEMENT 9

Load dispatch computer – Dedicated microcomputer for sequencing data and alarming – Protective relaying

Total: 45

TEXT BOOKS

1. Considine, D.M. and Ross, S.F., “Hand book of Applied Instrumentation”, McGraw-Hill, 1964.
2. Doebelin, E.O., “Measurement Systems-Application and Design”, 5th Edition, Tata McGraw-Hill, 2004

REFERENCE

1. Liptak, B.G., “Instrumentation in processing Industries” Ghilton Book Co., 1973.

EI1006 – TELEMETRY AND TELECONTROL

(Common to EIE and ICE)

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UNIT I TELEMETRY FUNDAMENTALS AND CLASSIFICATION 9

Fundamental concepts and Significance – Functional blocks of Telemetry and telecontrol system – Methods of telemetry – Electrical, Pneumatic, Hydraulic and Optical Telemetry – State of the art – Telemetry standards

UNIT II LANDLINE TELEMETRY 9

Electrical Telemetry – Current Systems – Voltage Systems – Synchro Systems – Frequency systems – Position and pulse systems – Landline telemetry system

UNIT III RADIO TELEMETRY 9

Block diagram of a radio telemetry system – Transmitting and receiving techniques – AM – FM – PM – Multiplexing and demultiplexing – Transmitting and receiving techniques – Digital coding methods – Advantages of PCM, PWM, PM, FSK – Delta modulation – Coding and decoding equipment – Example of a radio telemetry system

UNIT IV OPTICAL TELEMETRY 9

Optical fibers for signal transmission – Sources for fiber optic transmission – Optical detectors – Trends in fiber-optic device development – Example of an optical telemetry system

UNIT V TELECONTROL METHODS 9

Analog and Digital techniques in Telecontrol – Telecontrol apparatus – Remote adjustment – Guidance and regulation – Telecontrol using information theory – Example of a Telecontrol system

Total: 45

TEXT BOOKS

1. Gruenberg, L., “Handbook of Telemetry and Remote Control”, McGraw-Hill, 1987.
2. Swobodoa G., “Telecontrol Methods and Applications of Telemetry and Remote Control”, Reinhold Publishing Corporation, 1988.

REFERENCES

1. Young, R.E., “Telemetry Engineering”, Little Books Ltd, 1988.
2. Housley, T., “Data Communication and Teleprocessing System”, Prentice Hall International, Englewood Cliffs, 1987.

EI1007 – INSTRUMENTATION FOR POLLUTION CONTROL

(Common to EIE and ICE)

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UNIT I ENVIRONMENTAL MONITORING 9

Classification – Ambient environmental monitoring – Source monitoring – In-plant environment monitoring – Personal monitoring – Precision and accuracy – Errors in measuring signals

UNIT II AIR POLLUTION CONTROL 9

Air pollutant – Basis of monitoring technologies like conductometry – Coulometry – Turbidimetry – Nephlometry – Electrochemical cell method – Piezo-electric oscillation methods – Paper type method – Optical method – Air pollution monitoring instruments (manual and automatic)

UNIT III WATER POLLUTION MONITORING 9

Water pollutants – Basic techniques – Spectrometric methods – Emission spectrography – Automatic absorption spectro photometry – Absorption photometry – Potentimetry – Marine pollution monitoring – Polarography – Chromatogrophic method – Water pollution monitoring instruments – Auto analyzer for quality using flow injection analysis – Classical methods – GC, HPLC and ion chromatography

UNIT IV NOISE AND SOIL POLLUTION MONITORING 9

Noise pollution and its measurements – Soil pollution – Pollutants and its monitoring – Decibel meter – Psophometer – Noise pollution analyzer─anti noise device

UNIT V INDUSTRIAL POLLUTANTS AND ITS MONITORING 9

Monitoring of industrial pollution and pollution from hazardous wastes – Analysis techniques

Total: 45

TEXT BOOK

1. Sharma, B.K. and Kaur, H., “Environmental Chemistry”, Goel Publishing House, 1994.

REFERENCE

1. Andrew D. Eaton, Mary Ann H. Franson, “Standard Methods for the Examination of Water and Waste Water”, 20th Edition, APHA, 1998.

EI1008 – INSTRUMENTATION AND CONTROL IN IRON AND STEEL INDUSTRIES

(Common to EIE and ICE)

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UNIT I FLOW DIAGARM AND DESCRIPTION OF PROCESS 9

Raw materials preparation – Iron making blast furnaces – Stoves – Raw steel making – Basic Oxygen furnace – Electric furnace.

UNIT II STEEL ROLLING 9

Casting of steel – Primary rolling – Cold rolling and finishing.

UNIT III INSTRUMENTATION 9

Measurement of level – Pressure – Density – Temperature – Flow weight – Thickness and shape – Graphic displays and alarms.

UNIT IV CONTROL AND SYSTEMS 9

Blast furnace stove combustion control system – Gas and water controls in BOF – Stand casting mould level control.

UNIT V COMPUTER APPLICATIONS 9

Model calculating and logging – Rolling mill control computer – Annealing process control computer – Center utilities dispatch computer.

Total: 45

TEXT BOOK

1. Liptak, B.G., “Instrumentation in Processing Industries” Ghilton Book Co., 1973.

REFERENCE

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