UNIVERSITY DEPARTMENTS

ANNA UNIVERSITY CHENNAI :: CHENNAI 600 025

REGULATIONS – 2008

CURRICULUM FROM III & IV SEMESTERS FOR

B.E. ELECTRICAL AND INSTRUMENTATION ENGINEERING

SEMESTER III

CODE NO	COURSE TITLE	L	T	P	C
THEORY					
EI9201	Digital Logic Theory	3	0	0	3
EE9211	Electrical Machines	3	0	0	3
MA9211	Mathematics – III	3	1	0	4
EC9211	Electron Devices and Circuits	3	0	0	3
ME9211	Thermodynamics	2	0	0	2
CE9211	Fluid Mechanics	2	0	0	2
PRACTICAL					
EI9202	Analog and Digital Electronics Laboratory	0	0	3	2
EE9212	Electrical Machines Laboratory	0	0	3	2
ME9212	Mechanical Science Laboratory	0	0	3	2
	TOTAL				**23**

SEMESTER IV

CODE NO	COURSE TITLE	L	T	P	C
THEORY					
MA9264	Linear Algebra and Numerical Methods	3	1	0	4
EE9261	Electrical and Electronic Measurements	3	0	0	3
EI9251	Transducers Engineering	3	0	0	3
EC9261	OP-AMPS and Linear Integrated Circuits	3	0	0	3
EC9262	Communication Engineering	3	0	0	3
GE9021	Environmental Science and Engineering	3	0	0	3
PRACTICAL					
EI9252	Transducers and Measurements Laboratory	0	0	3	2
EC9263	Integrated Circuits Laboratory	0	0	3	2
	TOTAL				**23**

EI9201 DIGITAL LOGIC THEORY 3 0 0 3

AIM:

The course is designed to introduce the fundamental concepts and design of digital system.

OBJECTIVES:

- To introduce the basic concept about the number systems, binary codes and combinational circuits.
- To cover the basic postulates of Boolean Algebra and the implementation of circuits using gates.
- To provide an introduction to flip flops and to design a synchronous circuit.
- To introduce the most common digital logic families.

PREREQUISITE

Not Required.

BOOLEAN ALGEBRA 9

Review of Number Systems – Fixed point and floating point representations – Review of computer codes - Number complements - Signed number addition and subtraction - Boolean Algebra - Demorgan's theorem - Canonical forms - Simplification of Boolean functions using K-maps and Quine Mclusky methods.

COMBINATIONAL LOGIC DESIGN 9

Gates - Universal set of modules - Standard combinational modules - Decoders - Encoders – Multiplexers - Demultiplexers – Comparators - Code Converters - Function realization using Gates and Multiplexers – Adders - Carry Look Ahead Adder - Subtraction using adders - BCD adder.

SEQUENTIAL LOGIC DESIGN 9

Basic latch circuit - Flip-flops - Truth table – Excitation table - Analysis and design of synchronous sequential circuits - Transition table - Transition diagram – Introduction to asynchronous sequential circuits - Race in sequential circuits - Hazards - Techniques for controlling hazards.

COUNTERS AND SHIFT REGISTERS 9

Asynchronous Counter design and Synchronous Counter design - Up/Down counter - Modulus counter - Shift Registers - Johnson Counter – Ring Counter -Application of Counters and Shift Registers.

INTRODUCTION TO LOGIC FAMILIES 9

Introduction to logic families: - RTL, DTL, ECL, TTL, NMOS, CMOS - GaAs Building blocks - Operating conditions –Interfacing between different families.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Morris Mano, M., “Digital Design”, Prentice Hall, 2006.
2. Malvino, A., and Leach, D., “Digital Principles and Applications”, Tata McGraw Hill, 2002.

REFERENCE BOOKS:

1. Tocci, R.J., “Digital systems: Principles and Applications”, Prentice Hall, 8th Edition, 2005.
2. Taub and Schilling, “Digital Integrated Electronics”, Tata McGraw Hill, 1998.
3. Floyd and Jain, “Digital Fundamentals”, Pearson Education, 2003.

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EE9211 ELECTRICAL MACHINES 3 0 0 3

AIM:

To impart basic knowledge on Electrical machines, principles and its behavior.

OBJECTIVES:

At the end of this course, student would have been exposed to:

- Theory of structures, operating principle, characteristics, and applications of D.C and A.C rotating machines and transformers in detail.
- Introductory knowledge on Special Machines.

PREREQUISITE

Physics, Electromagnetics and Electric circuit analysis.

D.C. MACHINES 12

Construction of D.C. Machines - Principle and theory of operation of D.C. generator - EMF equation - Characteristics of D.C. generators - Armature reaction – Commutation - Principle of operation of D.C. motor - Voltage equation - Torque equation - Types of D.C. motors and their characteristics –Starters - Speed control of D.C. motors - Applications.

TRANSFORMERS 9

Principle - Theory of ideal transformer - EMF equation - Construction details of shell and core type transformers - Tests on transformers - Equivalent circuit - Phasor diagram - Regulation and efficiency of a transformer - Introduction to three - phase transformer connections.

SYNCHRONOUS MACHINES 8

Principle of alternators:- Construction details, Equation of induced EMF and Vector diagram - Synchronous motor:- Starting methods, Torque, V curves, Speed control and Hunting.

INDUCTION MACHINES 9

Induction motor:- Construction and principle of operation, Classification of induction motor, Torque equation, Condition for maximum torque, Equivalent Circuit, Starting methods and Speed control of induction motors.

SPECIAL MACHINES 7

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 - Permanent magnet synchronous motor – Switched reluctance motor – Brushless D.C motor.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Nagrath, I.J., and Kothari, D.P., " Electrical Machines", Tata McGraw - Hill, 1997.
2. Fitzgerald A.E, Kingsley C., Umans, S. and Umans S.D., "Electric Machinery", McGraw-Hill, Singapore, 2000.

REFERENCE BOOKS:

1. Theraja, B.L., "A Text book of Electrical Technology", Vol.II, S.C Chand and Co., New Delhi, 2007.
2. Del Toro, V., "Electrical Engineering Fundamentals", Prentice Hall of India, New Delhi, 1995.
3. Cotton, H., "Advanced Electrical Technology", Sir Isaac Pitman and Sons Ltd., London, 1999.

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MA9211 MATHEMATICS III 3 1 0 4

AIM:

The aim of this course is to train the students' in additional areas of Engineering Mathematics, necessary for grooming them into successful Engineers. The topics introduced will serve as basic tools for specialized studies in many Engineering fields, significantly in Fluid Mechanics, Field Theory and Communication Engineering.

OBJECTIVES:

- On completion of the course the students are expected to have grasped the basics of partial differential equations, Boundary value problems, Fourier series and transform, Z- transform and Difference equations.

PARTIAL DIFFERENTIAL EQUATIONS 9

Formulation – Solution of first order equations – Standard types - Equations reducible to standard types – Lagrange's linear equation – Integral surface passing through a given curve – Solution of linear equations of higher order with constant coefficients.

FOURIER SERIES 9

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series and cosine series – Complex form of Fourier series – Parseval's identity – Harmonic analysis.

BOUNDARY VALUE PROBLEMS 9

Method of separation of variables - Solutions of one dimensional wave equation - One dimensional heat equation - Steady state solution of two-dimensional heat equation - Fourier series solutions in Cartesian coordinates.

FOURIER TRANSFORM 9

Fourier integral theorem - Fourier transform pair - Sine and Cosine transforms - Properties - Transforms of simple functions - Convolution theorem - Parseval's identity.

Z-TRANSFORM AND DIFFERENCE EQUATIONS 9

Z-transform - Elementary properties - Inverse Z–transform - Convolution theorem - Difference equation formulation - Solution of difference equations using Z-transform.

L:45 T:15, TOTAL = 60

TEXT BOOKS:

1. Grewal, B.S., "Higher Engineering Mathematics", 36th Edition, Khanna Publishers, Delhi, 2001.

REFERENCE BOOKS:

1. Andrews, L.A. and Shivamoggi B.K., "Integral Transforms for Engineers and Applied Mathematicians", Macmillen, New York, 1988.
2. Narayanan, S., Manickavachagam Pillai, T.K. and Ramaniah, G., "Advanced Mathematics for Engineering Students", Volumes II and III, S. Viswanathan (Printers and Publishers) Pvt. Ltd. Chennai, 2002.
3. Churchill, R.V., and Brown, J.W., "Fourier Series and Boundary Value Problems", 6th Edition, McGraw - Hill Book Co., Singapore, 2000.
4. Ray, W. C. and Barrett Louis, C., "Advanced Engineering Mathematics", 6th Edition, McGraw-Hill, Inc., New York, 1995.

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EC9211 ELECTRON DEVICES AND CIRCUITS 3 0 0 3

AIM

To provide an exposure to various electronic devices and electronic circuits.

OBJECTIVES

- At the end of the course, students' will have the knowledge about functioning of various types of devices and design of various electronic circuits.

SEMICONDUCTOR DIODE AND BJT 9

PN Junction – Current components in a PN diode – Junction capacitance – Junction diode switching time – Zener diode – Varactor diode – Tunnel diode – Schottky diode – Transistor Structure – Basic Transistor operation – Transistor characteristics and parameters – The transistor as a switch, as an amplifier – Transistor bias circuits:- Voltage divider bias circuits, base bias circuits, emitter bias circuits, collector feedback bias circuits – DC load line – AC load line- bias stabilization, thermal runaway and thermal stability.

FET, UJT and SCR 9

JFET characteristics and parameters – JFET biasing, self bias, voltage divider bias – Q point, stability over temperature – MOSFET D-MOSFET, E-MOSFET – MOSFET characteristics and parameters – MOSFET biasing, zero bias, voltage divider bias method, drain feedback bias – Characteristics and applications of UJT, SCR, DIAC, TRIAC.

AMPLIFIERS 9

CE, CC and CB amplifiers - Small signal low frequency transistor amplifier circuits - h parameter representation of a transistor - Analysis of single stage transistor amplifier using parameters voltage gain, current gain, input impedance and output impedance-frequency response - RC coupled amplifier.

Classification of Power amplifiers:- Class A, B, AB and C Power amplifiers-Push-Pull and Complementary Symmetry Push-Pull amplifiers - Design of power output, efficiency and cross-over distortion.

FEEDBACK AMPLIFIERS AND OSCILLATORS 9

Advantages of negative feedback - Voltage/current, series/shunt feedback-Positive feedback - Condition for oscillators - Phase shift - Wein Bridge – Hartley - Colpitts and crystal oscillators.

PULSE CIRCUITS AND POWER SUPPLIES 9

RC wave shaping circuits - Diode clampers and clippers – Multivibrators -Schmitt triggers - UJT - Saw tooth oscillators - Single and polyphase rectifiers and analysis of filter circuits - Design of zener and transistor series voltage regulators - Switched mode power supplies.

L = 45 TOTAL = 45

TEXT BOOKS

1. Millman and Halkias, “Electronic Devices and Circuits”, Tata McGraw– Hill, 2007.
2. Floyd, T.L, “Electronic Devices” 6th Edition, Pearson Education, 2003.
3. Millman and Halkias, “Integrated Electronics”, McGraw-Hill, 2004.

REFERENCE BOOKS

1. Mottershead, A., “Electronic Devices and Circuits an Introduction”, Prentice Hall of India, 2003.
2. Boylsted and Nashelsky, “Electronic Devices and Circuit Theory”, Prentice Hall of India, 6th Edition, 1999.
3. Streetman, B. and Sanjay, B., “Solid State Electronic Devices”, Prentice-Hall of India, 5th Edition, 2005.
4. Bell, D.A., “Electronic Devices and Circuits”, Prentice Hall of India, 4th Edition, 1999.
5. Millman, J., Prakash Rao., M.S. and Taub, H., “Pulse Digital and Switching Wave Forms”, McGraw-Hill, 2007.

ME9211 THERMODYNAMICS 2 0 0 2

AIM:

To study the basic concepts of thermodynamics and apply it to various applications.

OBJECTIVES:

- To integrate the concepts, Laws and Methodologies from Thermodynamics for the analysis of cyclic process.
- To apply the Thermodynamics concepts into various Thermal applications like, IC Engines, Thermal Power Plant, Air Conditioning and Heat transfer.

PREREQUISITE

Not Required

LAWS OF THERMODYNAMICS 6

Thermodynamic System - Zeroth Law of Thermodynamics - First Law of Thermodynamics - Concept of Internal Energy and Enthalpy applications to open and closed systems - Second Law of Thermodynamics - Concept of Entropy.

GAS LAWS, AIR CYCLES AND COMPRESSORS 6

Basic IC Engine and Gas turbine cycles – Single stage and Multistage reciprocating compressors.

STEAM BOILERS 6

Formation of steam - Properties of steam – Rankine cycle – Modern features of high pressure boilers – Mountings and accessories.

REFRIGERATION 6

Basic Thermodynamics of refrigerators and heat pumps - Various methods of producing refrigerating effects – Vapour compression cycle – P-H and T-S diagrams - Air conditioning.

HEAT TRANSFER 6

One dimensional heat conduction:- Plain wall, Cylinder, Sphere and Composite walls – Heat transfer through extended surfaces – Free and forced convections – Radiation:- Black body and Gray body.

TOTAL: 30 PERIODS

TEXT BOOKS:

1. Nag, P.K., “Basics and Applied Thermodynamics”, Tata McGraw – Hill Pub. Co., 2002.

REFERENCE BOOKS:

1. Reynolds, W.C. and Perkins, H.C., “Engineering Thermodynamics”, International Student Edition, McGraw-Hill Co. Ltd., 2nd Edition, 1990.

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CE9211 FLUID MECHANICS 2 0 0 2

AIM:

To study the various types of fluid flow, pumps and turbines.

OBJECTIVES:

- This course will give an introduction to the fundamental properties of fluids, dimensional analysis, model analysis, pumps, turbines and their applications.

PREREQUISITE

Not required

BASIC CONCEPTS OF FLUID MECHANICS 6

Introduction – Classification – Types of fluids – Properties – Laws of Pressure – Atmospheric Pressure, Gauge Pressure, Absolute Pressure - Pressure measurement:- Manometers and Mechanical gauges.

FLOW OF FLUIDS 6

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.

DIMENSIONAL AND MODEL ANALYSIS 6

Introduction – Dimensions – Dimensional analysis – Rayleigh's and Buckingham's method û similitude - Dimensionless numbers and their significance – Similarity Laws.

PUMPS 6

Introduction – Reciprocating pump:- Construction details, Co-efficient of discharge, Slip and Power – Centrifugal pump:- Classification, Working principle and Specific speed.

TURBINES 6

Turbine:- Classification of Turbines and Working Principle.

TOTAL: 30 PERIODS

TEXT BOOKS:

1. Bansal, R.K., "Fluid Mechanics", Laxmi publishers, 2007

REFERENCE BOOKS:

1. Shames, I.H., "Mechanics of Fluids", Kogakusha, Tokyo, 1998.
2. Radhakrishnan, E., "Introduction to Fluid Mechanics", Prentice Hall, India 1999.

3. Rajput R.K., “Fluid Mechanics and Hydraulic Machines”, S.Chand and Co., India, 1998.
4. Kumar, K.L., “Fluid Mechanics”, S.Chand Publishers, New Delhi, 2004.

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EI9202 ANALOG AND DIGITAL ELECTRONICS LABORATORY 0 0 3 2

1. Construction of Rectifiers and Voltage Regulators.
2. Frequency responses of BJT and FET based Amplifiers.
3. Characteristic of Differential Amplifier and Study of Power Amplifiers.
4. Construction of UJT Relaxation Oscillator.
5. Design of Wave Shaping Circuits.
6. Design of RC and LC Oscillators.
7. Design of Binary Adder/Subtractor/Comparator.
8. Study of Shift Registers and Counters.
9. Design of Multiplexer and Demultiplexer.
10. Design of Encoder and Decoder.
11. Design of BCD to Seven segment Decoder.
12. Construction and Verification of Circuits using Virtual Instrumentation Package.

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EE9212 ELECTRICAL MACHINES LABORATORY 0 0 3 2

1. Open circuit characteristic of DC Shunt Generator.
2. Load test on DC Shunt Generator.
3. Speed control of DC Shunt Motor.
4. Brake test on DC Shunt Motor.
5. Brake test on DC Series Motor.
6. Regulation characteristic of three - phase Alternator.
7. Open circuit and short circuit tests on Single - phase Transformer.
8. Load test on Single - phase Transformer
9. Load test on Three - phase Induction Motor.
10. Brake test on Single - phase Induction Motor.
11. ‘V’ curves of Synchronous Motor.
12. Power measurement in three - phase circuit using two - wattmeter method.

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ME9212 MECHANICAL SCIENCE LABORATORY 0 0 3 2

1. Tension Test
2. Torsion Test
3. Testing of springs
4. Impact test i) Izod, ii) Charpy
5. Hardness test i) Vickers, ii) Brinell, iii) Rockwell, iv) Shore
6. Deflection of Beams
7. Dye Penetrant Test
8. Performance test on a 4 stroke engine
9. Viscosity determination of the given fluid
10. Moment of inertia of connecting rod
11. Determination of Effectiveness of a parallel and counter flow heat exchangers
12. Valve timing of a 4 stroke engine and port timing of a 2 stroke engine
13. Tensile testing of polymers
14. Flex fatigue test for elastomers
15. Hardness test for rubber and plastics.
16. Injection moulding machine operation

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MA9264 LINEAR ALGEBRA AND NUMERICAL METHODS 3 1 0 4

AIM/ OBJECTIVES

The students would be acquainted with the basic concepts of Linear Algebra and numerical methods and their applications.

VECTOR SPACE AND LINEAR TRANSFORMATIONS 9

Vector spaces – Subspaces – Linear spans – Linear independence and Linear dependence – Basis and Dimension – Linear Transformation, Null space and range – Dimension theorem (no proof) – Matrix representation of Linear Transformation.

INNER PRODUCT SPACES 9

Change of basis – Dual space – Inner Product Spaces – Norms and Cauchy – Schwarz inequality – Orthonormal sets – Gram Schmidt orthonormalization process – Adjoint of linear operator – Method of Least squares.

NUMERICAL LINEAR ALGEBRA 9

Gauss elimination method – Pivoting strategy – Gauss elimination method for tridiagonal matrix – Jacobi, Gauss- Seidel iterative Method –Power method and QR method for Eigenvalues.

INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION 9

Lagrange's and Newton's divided difference interpolation - Newton's forward and backward difference interpolation – Numerical differentiation by finite differences – Trapezoidal, Simpson's 1/3 and Gaussian Quadrature formula.

NUMERICAL SOLUTION OF ORDINANRY DIFFERENTIAL EQUATIONS 9

Numerical solution of first order ordinary differential equations by taylor series method – Euler Method - Fourth order Runge-Kutta Method - Finite difference methods for two point boundary value problems.

L = 45 T = 15 TOTAL = 60

TEXT BOOKS

1. Friedberg, A.H., Insel, A.J. and Spence, L., "Linear Algebra", Prentice Hall of India, New Delhi, 2004.
2. Faires, J.D. and Burder, R., "Numerical Methods", Brooks/Cole (Thomson Publications), New Delhi, 2002.

REFERENCE BOOKS

1. Kumaresan, S., “Linear Algebra – A geometric approach”, Prentice – Hall of India, New Delhi, 2000.
2. Strang, G., “Linear Algebra and its applications”, Thomson (Brooks/Cole), New Delhi, 2005.
3. Jain, M.K, Iyengar, S.R.K, and Jain, R.K., “Numerical methods for Scientific and Engineering Computation”, New Age International Publishers, New Delhi, 2003.
4. Gerald, C.F, and Wheatly, P.O., “Applied Numerical Analysis”, Pearson Education, New Delhi, 2002.

EE9261 ELECTRICAL AND ELECTRONIC MEASUREMENTS 3 0 0 3

AIM:

The course is designed to equip the students to apply all types of common electrical and electronic instruments with the knowledge about the construction and working of the instruments.

OBJECTIVES:

- To introduce the construction and working of different types of ammeters, voltmeters and bridges.
- To introduce different types of power and energy meters.
- To provide an introduction to current and voltage transformers and to explain the advantages of these transformers compared to other measuring devices.
- To introduce digital meters, displays and recorders which help in analysing and displaying the data.

PREREQUISITE

Not Required.

MEASUREMENT OF ELECTRICAL PARAMETERS 9

Types of ammeters and voltmeters – PMMC Instruments – Moving Iron Instruments – Dynamometer type Instruments – Resistance measurement:- Wheatstone bridge, Kelvin double bridge and Direct deflection methods. Measurement of Inductance:- Maxwell Wein bridge, Hay's bridge and Anderson bridge - Measurement of capacitance:- Schering bridge .

POWER AND ENERGY MEASUREMENTS 9

Electrodynamic type wattmeter – Theory and its errors – Methods of correction – LPF wattmeter – Induction type wattmeter – Phantom loading – Induction type kWh meter – Theory and adjustments – Calibration of wattmeter and energy meters.

POTENTIOMETERS AND INSTRUMENT TRANSFORMERS 9

Student type potentiometer – Precision potentiometer – A.C. Potentiometers:- Polar and Co-ordinate types – Applications – Instrument Transformer:-Construction and theory of Current Transformers and Potential Transformers and Phasor diagrams.

ANALOG AND DIGITAL INSTRUMENTS 10

Wave analyzers – Signal and function generators - Distortion factor meter –
Q meter - Digital voltmeter and multimeter – DMM with auto ranging and self diagnostic features – Frequency and Time interval measurements.

DISPLAY AND RECORDING DEVICES **8**

Cathode ray oscilloscope – Classification - Sampling and storage scopes – Seven segment and dot matrix displays – X-Y recorders – Magnetic tape recorders – Data loggers.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Kalsi H.S., "Electronic Instrumentation", 2nd Edition, Tata McGraw-Hill Company, New Delhi, 2004.
2. Sawhney A.K, "A course in Electrical and Electronic Measurement and Instrumentation", Dhanpat Rai and Sons, New Delhi, 2003.

REFERENCE BOOKS:

1. Bell, A.D., "Electronic Instrumentation and Measurements", 2nd Edition, Prentice Hall of India, New Delhi, New Delhi, 2003.
2. Bowens, A. J, "Digital Instrumentation", 4th Edition, Tata McGraw - Hill India Ltd., 1986.

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EI 9251 TRANSDUCERS ENGINEERING 3 0 0 3

AIM:

To know how physical quantities are measured and how they are converted to electrical or other forms.

OBJECTIVES:

- This course elaborates the purpose of measurement, the methods of measurements, errors associated with measurements, the principle of transduction, classifications and the characteristics of different transducers and their recent developments and practical applications.

PREREQUISITE

Not Required

SCIENCE OF MEASUREMENT AND TRANSDUCTION 9

Units and standards – Calibration methods – Classification of errors - Error analysis – Limiting error - Probable error - Propagation of errors- Odds and uncertainty- Principle of transduction - Classification.

CHARACTERISTICS OF TRANSDUCERS 9

Static characteristics – Mathematical model of transducers:- Zero, first and second order transducers –Dynamic characteristics of first and second order transducers for standard test inputs.

VARIABLE RESISTANCE TRANSDUCERS 9

Principle of operation - Construction details - Characteristics and applications of Resistance potentiometers - Strain Gauges - Resistance thermometers – Thermistors - Hotwire anemometer - Piezoresistive sensors and humidity sensors.

VARIABLE INDUCTANCE AND VARIABLE CAPACITANCE TRANSDUCERS 9

Inductive potentiometer – Variable Reluctance transducers:- EI pick up and LVDT – Capacitive transducers:- Variable air gap type, Variable area type and Variable permittivity type – Capacitor microphone.

SPECIAL TRANSDUCERS 9

Piezoelectric transducer – Magnetostrictive transducer – Semiconductor sensor – Digital transducers – Smart sensors – Fiber optic transducers - Hall effect transducers - Introduction to MEMS Sensors and Nanosensors.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Doeblin, E.O., “Measurement Systems: Applications and Design”, 4th Edition, Tata McGraw-Hill Book Co., 2003.
2. Renganathan, S., “Transducer Engineering”, Allied Publishers, 2003.

REFERENCE BOOKS:

1. Bentley, J. P., “Principles of Measurement Systems”, 4th Edition, Addison Wesley Longman Ltd., UK, 2004.
2. Patranabis, D., “Sensors and Transducers”, 2nd Edition, Prentice Hall India Pvt. Ltd, 2003.
3. Murthy, D.V.S., “Transducers and Instrumentation”, Prentice Hall of India Pvt. Ltd., New Delhi, 2007.
4. Neubert H.K.P., “Instrument Transducers – An Introduction to their Performance and Design”, Oxford University Press, Cambridge, 2003.

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EC 9261 OP-AMPS AND LINEAR INTEGRATED CIRCUITS 3 0 0 3

AIM

To introduce the concepts for realising functional building blocks in ICs, fabrications & application of ICs.

OBJECTIVES

- To study the IC fabrication procedure.
- To study characteristics; realize circuits; design for signal analysis using Op-amp ICs.
- To study the applications of Op-amp.
- To study internal functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits, ADCs.

FABRICATION OF INTEGRATED CIRCUITS 9

Silicon Wafer Preparation – Epitaxial growth –Photolithography – Etching – Diffusion: - Thermal Diffusion and Ion implantation – Metallization – Packaging – Realization of passive and active devices:- Resistor, Capacitor, diode, BJT, FET and MOS transistors.

LINEAR INTEGRATED CIRCUITS 9

Introduction to Linear IC – Operational amplifiers – DC characteristics:- bias, offset and drift –AC characteristics:- bandwidth, slew rate and noise - Inverting and non-inverting amplifiers - Zero crossing detector with hysteresis – Arithmetic Circuits.

APPLICATIONS OF OP-AMP 9

Precision rectifiers – Active filters – Butterworth low-pass filter and Butterworth high-pass filter - Waveform generators: - Square, triangular and sine wave – V to I converter and I to V converter- Instrumentation Amplifier - Log and antilog amplifiers.

TIMER AND PHASE-LOCKED LOOP **6**

Basic functional block diagram - Characteristics and applications of ICs:- 555, 565, 566, LM 723 voltage regulator and current regulator**.**

SPECIAL FUNCTIONS ICs **12**

Functional Block diagram of ADC and DAC – Sample and Hold circuit - Successive Approximation ADC - Integrating ADC – Sigma Delta ADC – Study of successive approximation ADC IC – Study of Integrating ADC IC – Study of Sigma Delta ADC IC – Study of 8 bit DAC IC – Temperature Sensor IC - Piezoelectric Pressure Sensor IC – Hall-Effect sensor IC and Level sensor IC.

L = 45 TOTAL = 45

TEXT BOOKS

1. Gayakwad, R.A, "OP-Amps and Linear Integrated Circuits", Prentice Hall of India, New Delhi, 4th Edition, Pearson Education, 2003.
2. Choudhury, R. and Jain, S., "Linear Integrated Circuits", 3rd Edition, New Age Pub., 2007.

REFERENCE BOOKS

1. Botkar, K.R., "Integrated circuits", Khanna Publishers, New Delhi, 2003.
2. Millman, J., and Halkias, C. C., "Integrated Electronics - Analog and Digital circuits System", Tata McGraw-Hill, 2003.
3. Coughlin, R.F., Driscoll, F. F., "Operational Amplifiers and Linear Integrated Circuits", Pearson Education (P) Ltd, 6th Edition, 2006.
4. Franco, S., "Design with Operational and Analog Integrated Circuits", Tata McGraw-Hill Publishing Co., 3rd Edition, 2002.
5. Bell, D.A, "Op-amp & Linear ICs", Prentice Hall of India, 2nd Edition, 2007.

EC9262 COMMUNICATION ENGINEERING 3 0 0 3

AIM

It provides an idea of different modulation principles and communication systems.

OBJECTIVES

- To understand the ways of modulation, methods of data transmission for communication.

AMPLITUDE MODULATION 10

Amplitude modulation:- Basic principle of AM – Frequency spectrum and Bandwidth, Modulation index, AM power distribution and AM modulator circuits - AM transmitters:- Low level transmitters and High level transmitters - AM reception:- AM Receivers, TRF, Super heterodyne receivers and Double conversion AM Receivers.

ANGLE MODULATION 10

Angle modulation:- FM and PM waveforms, Frequency deviation, Phase Deviation and Modulation index, Frequency spectrum of Angle modulated wave - Phase and Frequency modulator and demodulator, Direct FM Transmitter, Indirect transmitters, Angle modulation versus Amplitude Modulation, FM receivers and Frequency versus Phase Modulation.

PULSE COMMUNICATION SYSTEMS 6

PAM, PPM, PDM, PCM, Delta modulation, Differential PCM, Merit and demerits - Concept of multiplexing:- FDM and TDM.

DATA TRANSMISSION 9

Base band signal receiver:- Error probability, Optimum and matched filter techniques and Coherent reception - Digital modulation systems:- ASK, FSK and PSK, Comparison of data transmission systems.

COMMUNICATION SYSTEMS ANDTELEVISION 10

Optical fibers:- Single Mode Fibers, Graded Index fiber structure, Losses in optical Fibers, Fiber optic communication link - Introduction to micro wave communication system, Principle of satellite communication - Television:- Scanning methods, B/W and color systems – Camera and Picture tubes, Synchronization, Transmitters and Receivers.

L = 45 TOTAL = 45

TEXT BOOKS

1. Singh, R.P. and Sapre, S.D., “Analog and Digital Communication Systems”, McGraw-Hill Publishing Company Ltd., 2003.
2. Kennedy, G., “Electronic Communication Systems”, McGraw-Hill, 4th Edition, 2003.
3. Gulati, R.P., “Modern Television Practice Principles, Technology and Servicing”, New Age International Pvt. Ltd., 2002.

REFERENCE BOOKS

1. Taub and Schilling, “Principles of Communication Systems”, 2nd Edition, McGraw-Hill, 1986.
2. Haykins, S., “Communication Systems”, 4th Edition, John Wiley Inc., 2000.
3. Carlson, A.B., “Communication Systems”, 3rd Edition, Tata McGraw- Hill, 2001.

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EC9263 INTEGRATED CIRCUITS LABORATORY 0 0 3 2

1. Design of arithmetic circuits using Op-Amps.
2. Design of I/V and V/I converters using OP-Amps.
3. Design of F/V and V/F converters using OP-Amps.
4. Characteristics of Instrumentation amplifier.
5. Design of oscillator circuit using Op – Amp.
6. Design of active filters using Op – Amps.
7. Design of precision rectifiers using OP – Amps.
8. Design of Sample and Hold circuit and Schmitt trigger.
9. Design of nonlinear Op – Amp circuits.
10. Regulated power supply using voltage regulator ICs.
11. 555 timer applications.
12. Study of Phase Locked Loop.

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GE 90 21 ENVIRONMENTAL SCIENCE AND ENGINEERING

L	T	P	C
3	0	0	3

AIM

To create awareness in every engineering graduate about the importance of environment, the effect of technology on the environment and ecological balance and make them sensitive to the environment problems in every professional endeavour that they participates.

OBJECTIVE

At the end of this course the student is expected to understand what constitutes the environment, what are precious resources in the environment, how to conserve these resources, what is the role of a human being in maintaining a clean environment and useful environment for the future generations and how to maintain ecological balance and preserve bio-diversity. The role of government and non-government organization in environment managements.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 14

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

Field study of common plants, insects, birds

Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 8

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.
Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation-central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Gilbert M.Masters, “Introduction to Environmental Engineering and Science”, 2nd edition, Pearson Education, 2004.
2. Benny Joseph, “Environmental Science and Engineering”, Tata McGraw-Hill, New Delhi, 2006.

REFERENCE BOOKS

1. R.K. Trivedi, “Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards”, Vol. I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T.H. Gorhani, “Environmental Encyclopedia”, Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, “Environmental law”, Prentice hall of India PVT LTD, New Delhi, 2007.
4. Rajagopalan, R, “Environmental Studies-From Crisis to Cure”, Oxford University Press, 2005.

EI9252 TRANSDUCERS AND MEASUREMENTS LABORATORY

0 0 3 2

1. Characteristics of Potentiometer and Strain Gauge Transducer.
2. Dynamic characteristics of various types of Thermocouple with and without Thermowell.
3. Static and Dynamic characteristics of RTD using Transducer Analysis Station.
4. Characteristic of LVDT using Transducer Analysis Station.
5. Lead wire compensation for RTD.
6. Cold junction compensation for Thermocouple.
7. Temperature compensation for Strain Gauge.
8. Fiber optic transducer based Level and Force measurements.
9. Study of Synchro - Transmitter and Synchro – Receiver
10. Wheatstone Bridge and Kelvin's Bridge for Measurement of Resistance.
11. Schering Bridge for Capacitance Measurement and Anderson Bridge for Inductance Measurement.
12. Determination of Critical Damping Resistance of a D'Arsonval Galvanometer.
13. Calibration of Single-phase Energy meter and Wattmeter.
14. Testing of Current Transformer.
15. Calibration of Ammeter and Voltmeter using Student type Potentiometer.
16. Design, Construction and Calibration of series and shunt type Ohmmeters.

LABORATORY REQUIREMENTS FOR A BATCH OF 30 STUDENTS

1. Potentiometer and Strain gauge.
2. Thermocouple with and without Thermowell - 3 Nos
3. CRO
4. RTD & Temperature bath.
5. LABVIEW Package.
6. LVDT.
7. Fiber optic Transducer kit.
8. Synchro-Transmitter and Synchro-Receiver unit.
9. Wheatstone Bridge/ Kelvin's Bridge/ Schering Bridge and Anderson Bridge.
10. D'Arsonval galvanometer.
11. Single phase Energy meter and Wattmeter.
12. Current Transformer.
13. Student type Potentiometer.
14. Series and shunt type ohmmeter.